

Homework 8

Chapter 22

Problem 33. In studies of the possibility of migrating birds using the Earth's magnetic field for navigation, birds have been fitted with coils as "caps" and "collars" as shown in Figure P22.33. (a) If the identical coils have radii of $r = 1.20$ cm and are $d = 2.20$ cm apart, with $N = 50$ turns of wire apiece, what current should they both carry to produce a magnetic field of $B = 4.50 \cdot 10^{-5}$ T halfway between them? (b) If the resistance of each coil is $R = 210\Omega$, what voltage should the battery supplying each coil have? (c) What power is delivered to each coil?

Problem 39. A packed bundle of $N = 100$ long, straight, insulated wires forms a cylinder of radius $R = 0.500$ cm. (a) If each wire carries $I = 2.00$ A, what are the magnitude and direction of the magnetic force per unit length acting on a wire located $r = 0.200$ cm from the center of the bundle? (b) Would a wire on the outer edge of the bundle experience a force greater or smaller than the value calculated in (a).

Problem 56. An $m = 0.200$ kg metal rod carrying a current of $I = 10.0$ A glides on two horizontal rails $l = 0.500$ m apart. What vertical magnetic field is required to keep the rod moving at a constant speed if the coefficient of kinetic friction between the rod and rails is $\mu_k = 0.100$?