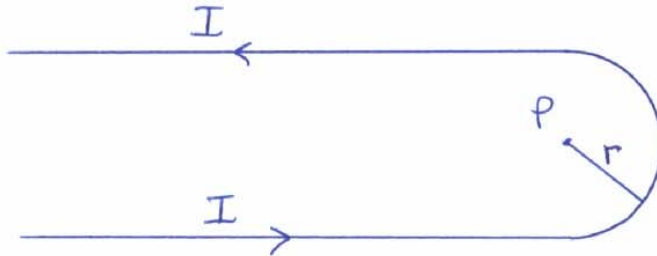


Physics 2020 Assignment 9

1. Suppose the current I that flows in the circuit show below is 6×10^{10} esu/sec or 20 amperes. The distance between the wires is 5 cm. How large is the force per centimeter of length that pushes horizontally on one of the wires?
2. A current of 8000 amperes flows through an aluminum rod 4 cm in diameter. Assuming the current density is uniform through the cross section, find the strength of the magnetic field at 1 cm, 2 cm and 3 cm from the axis of the rod.
3. A long wire is bent into the hairpinlike shape shown in the figure below. Find an exact expression for the magnetic field at the point P which lies at the center of the half circle.



4. The Earth's metallic core extends out to 3000 km, about half the Earth's radius. Imagine that the field we observe at the Earth's surface, which has a strength of roughly 0.5 gauss at the north magnetic pole is caused by a current flow around the "equator" of the core. How big would that current be in amperes?
5. A 50 kV direct current power line consists of two conductors 2 meters apart. When this line is transmitting 10 megawatts, how strong is the magnetic field midway between the conductors?
6. A solenoid is made by winding two layers of No. 14 copper wire on a cylindrical form 8 cm in diameter. There are four turns per centimeter in each layer and the length of the solenoid is 32 cm. From the wire tables we find that No. 14 copper wire, which has a diameter of 0.163 cm, has a resistance of 0.010 ohm/meter at 75°C. The coil will run hot!
 - a) If the solenoid is connected to a 50 volt generator, what will be the magnetic field strength at the center of the solenoid in gauss?
 - b) What is the power dissipation in watts?