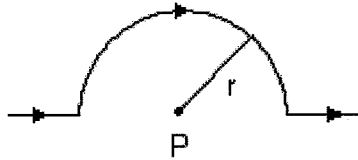
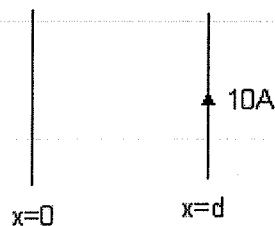


Physics 111 Homework Set #12 Chapter 30

- 49) A conductor in the shape of a square of edge length $l=0.4\text{m}$ carries a current $I=10\text{A}$ in the clockwise direction. Calculate the magnitude and direction of the magnetic field produced at the center of the square.
- 50) A segment of wire of total length $4r$ is formed into a semicircle of radius r as shown. If the wire carries a current of 6A , find the magnetic field at the point P when $r=2\pi\text{ cm}$.



- 51) Two long parallel wires each having mass per unit length 40 g/m , are suspended from a common support in a horizontal plane by strings 6cm long. Each wire carries the same current I causing the wires to repel each other such that the angle between the supporting strings is 16° . (a) Are the currents in the same or in opposite directions? (b) Find the magnitude of the current in each wire.
- 52) Some superconducting alloys at very low temperatures can carry very high currents. For example, Nb_3Sn wire at 10 K can carry 1000 A and still maintain its superconductivity. Determine the maximum magnetic field which can be achieved in a solenoid of length 25cm if 1000 turns of Nb_3Sn are wrapped outside the surface.
- 53) A solenoid 2.5cm in diameter and 30cm in length has 300 turns and carries 12 A . Calculate the magnetic flux through the surface of a 5cm disk that is perpendicular to and centered on the axis of the solenoid.
- 54) A toroid with a mean radius of 20 cm and 630 turns is filled with powdered steel whose magnetic susceptibility χ is 100 . If the current in the winding is 3.0 A , find B (assumed uniform) inside the toroid.
- 55) In Bohr's 1913 model of the hydrogen atom the electron is in a circular orbit of radius $5.3 \times 10^{-11}\text{ m}$ with a velocity of $2.2 \times 10^6\text{ m/s}$. (a) What is the magnetic moment due to the electron's motion? (b) If the electron orbits counterclockwise, what is the direction of μ ?
- 56) Two long parallel conductors carry current in opposite directions and are separated by a distance d . The one on the right carries a current of 10A . Point A is at the midpoint between the conductors and point C is a distance $d/2$ to the right of the 10A current. If $d=18\text{cm}$ and I is adjusted so that the magnetic field at C is zero, find (a) the values of the current in the left wire and (b) the magnetic field (magnitude and direction) at A .



- 57) Two circular coils of radius R are perpendicular to a common axis and separated by a distance R . A steady current I flows in the same direction around each coil. Find B on the common axis, a distance x from coil 1

