Physics 126 Discussion #8: Chapter 21.5-21.9

1. Two wires parallel to one another are separated by 1.0 m, as shown in the figure. Each carries a current of 3.0 A, but in opposite directions. Find the magnitude and direction of the magnetic field at a point P midway between the wires.

![Diagram of two wires with current directions](Image)

2. You are given 251 m of copper wire that can carry a current of 0.500 A without excessive heating. This wire is used to make a solenoid of 25.0 cm length and 3.00 cm diameter. Determine the magnetic field that can be achieved at the center of the solenoid.
3. Four long, parallel conductors all carry currents of 5.0 A. An end view of the conductors is shown in the figure below. The current directions for wires A and D are into the page (indicated by crosses) while the current directions for B and C are out of the page (indicated by dots). Calculate the magnitude and direction of the magnetic field at point P, located at the center of the square of edge length 0.40 m.
48. A proton is traveling to the right and encounters a region R which contains an electric field or a magnetic field.

The proton is observed to speed up. Which is the best conclusion about the region R?
A. There is a magnetic field pointing up the page.
B. There is a magnetic field pointing down the page.
C. There is an electric field pointing to the right.
D. There is an electric field pointing to the left.

49. A proton is traveling to the right and encounters a region S which contains an electric field or a magnetic field.

The proton is observed to bend up the page. Refer to the following possibilities:
I. There is a magnetic field pointing into the page.
II. There is a magnetic field pointing out of the page.
III. There is an electric field pointing up the page.
IV. There is an electric field pointing down the page.

Which is the best conclusion about the region S?
A. I only.
B. II only.
C. I or III.
D. II or IV.

52. An electron beam is traveling to the right, and encounters a region R with a magnetic field pointing down, as shown. This region also has an electric field. We observe that the effects of the magnetic force and of the electric force cancel, so that the electron beam is straight.

In which direction must the electric field point?
A. Up the page.
B. Down the page.
C. Into the page.
D. Out of the page.
Use the following information in questions 53 and 54:

A current $I$ is flowing through a wire loop as shown.

Point $P$ is in the middle of the loop.

53. What is the direction of the magnetic field at point $P$?
   A. Out of the page.
   B. Into the page.
   C. To the right.
   D. To the left.

54. If a proton is at point $P$ and moving upward ($\uparrow$), what is the direction of the acceleration of the proton?
   A. To the left.
   B. To the right.
   C. Up, that is, speeding up the proton.
   D. Down, that is, slowing down the proton.