Honors Physics Magnetism HW, part 1 (Homework)

For answers, send email to: admin@tutor-homework.com.
Include file name: Physics_Worksheet_0068
Price: $3

1.
Find the direction of the magnetic field on the positively charged particle moving in the various situations shown in Figure P19.3, if the direction of the magnetic force acting on it is as indicated.

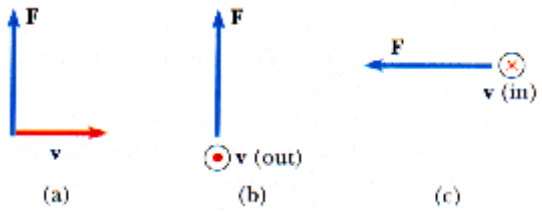

Figure P19.3.

(a)

(b)

(c)

2.
A proton travels with a speed of 1.0 ×10^6 m/s at an angle of 40° with the direction of a magnetic field of 0.40 T in the +*y* direction. What are
(a) the magnitude of the magnetic force on the proton and
(b) the proton's acceleration?

3.
An electron is accelerated through 2550 V from rest and then enters a region where there is a uniform 1.50 T magnetic field. What are the
(a) maximum values of the magnetic force and
(b) minimum values of the magnetic force this charge can experience?

4.
A wire carries a current of 15.0 A in a direction that makes an angle of 25.0° with the direction of a magnetic field of strength 0.400 T. Find the magnetic force on a 5.00-m length of the wire.

5.
The Earth has a magnetic field of 0.60 ×10^{-4} T, pointing 75° below the horizontal in a north-south plane. A 10.7 m long straight wire carries a 20 A current.
(a) If the current is directed horizontally toward the east, what are the magnitude and direction of the magnetic force on the wire?

Magnitude
Direction

(b) What are the magnitude and direction of the force if the current is directed vertically upward?
Magnitude
Direction

6.
A rectangular loop consists of 80 closely wrapped turns and has dimensions 0.40 m by 0.30 m. The loop is hinged along the *y* axis, and the plane of the coil makes an angle of 30.0° with the *x* axis (Fig. P19.21). What is the magnitude of the torque exerted on the loop by a uniform magnetic field of 0.68 T directed along the *x* axis, when the current in the windings has a value of 1.2 A in the direction shown?

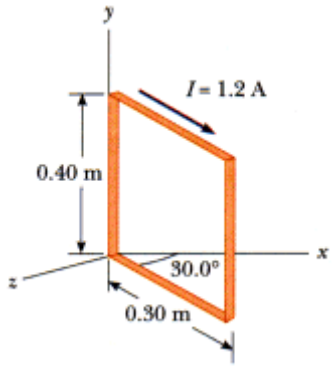

Figure P19.21.

What is the expected direction of rotation of the loop?

7.
A copper wire is 9.00 m long and has a cross-sectional area of 2.00 ×10^{-4} m^2. This wire forms a 1-turn loop in the shape of a square and is then connected to a 0.100-V battery. If the loop is placed in a uniform magnetic field of magnitude 0.500 T, what is the maximum torque that can act on it? The resistivity of copper is 1.7 ×10^{-8} Ω·m.
331 N·m

8.
A +4.0 μC charged particle with a kinetic energy of 0.090 J is placed in a uniform magnetic field of magnitude 0.20 T. If the particle moves in a circular path of radius 2.0 m, determine its mass.

9.
A singly charged positive ion has a mass of 2.49 ×10^{-26} kg. After being accelerated through a potential difference of 258 V, the ion enters a magnetic field of 0.535 T, in a direction perpendicular to the field. Calculate the radius of the path of the ion in the field.

10.
Find the direction of the current in the wire in Figure P19.36 that would produce a magnetic field directed as shown, in each case.

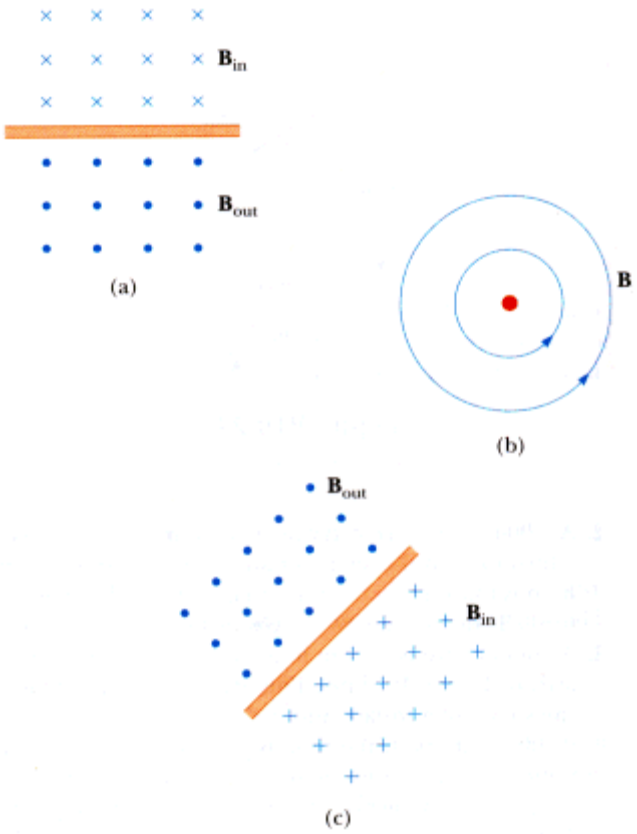

Figure P19.36.

(a)
(b)
(c)

11.
A wire with a weight per unit length of 0.077 N/m is suspended directly above a second wire. The top wire carries a current of 30.5 A and the bottom wire carries a current of 59.1 A. Find the distance of separation between the wires so that the top wire will be held in place by magnetic repulsion.

12.
A single-turn square loop of wire, 3.00 cm on a side, carries a current of 0.100 A. The loop is inside a solenoid, with the plane of the loop perpendicular to the magnetic field of the solenoid. The solenoid has 40 turns per centimeter and carries a current of 20.0 A. Find the force on each side of the loop and the torque acting on it.

13.
An electron moves at a speed of 1.1×10^4 m/s in a circular path of radius of 2.0 cm inside a solenoid. The magnetic field of the solenoid is perpendicular to the plane of the electron's path. Find
(a) the strength of the magnetic field inside the solenoid and
(b) the current in the solenoid if it has 25 turns per centimeter.

14.

At the Fermilab accelerator in Batavia, Illinois, protons having momentum 4.50×10^{-16} kg·m/s are held in a circular orbit of radius 1.10 km by an upward magnetic field. What is the magnitude of this field?