

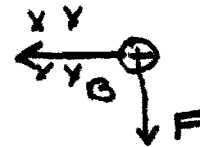
Magnetic Force Problems:

For each problem calculate the missing value and draw a diagram of the force, field, and direction of the velocity or current.

1. A positive charge of 0.25 C moves to the left at 200 m/s and enters a magnetic field of 0.40 T directed downward (into the page). What is the magnitude and initial direction of the force on the charge?

$$F = Bqv$$

$$F = 0.40(.25)(200) = 20 \text{ N}$$



2. An electron traveling at 100 m/s to the left enters a uniform magnetic field and experiences a force of 5.0×10^{-15} N directed up (out of the page). What is the magnitude and direction of the magnetic field? $q_e = 1.6 \times 10^{-19}$ C

$$F = Bqv$$

$$q_e = 1.6 \times 10^{-19}$$

$$v = 100$$

$$B = \frac{F}{qv} = \frac{5 \times 10^{-15}}{1.6 \times 10^{-19}(100)}$$

$B = 312 \text{ T}$



3. A straight wire of 50.0 cm long conducts a current of 4.00 A toward the top of the page, if the wire experiences a force of 0.02 N to the right. What is the magnitude and direction of the magnetic field?

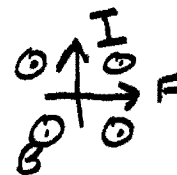
$$F = BIL$$

$$F = 0.02 \text{ N} \rightarrow$$

$$L = 0.5 \text{ m}$$

$$I = 4.0 \text{ A}$$

$$B = \frac{F}{IL} = \frac{0.02}{4(0.5)} = 0.01 \text{ T}$$



4. A magnetic field of 0.01 T is directed out of the page. Find the force on a straight 0.75 m long wire with a 15 amp current. If the force on the wire is directed toward the bottom of the page, what is the direction of the current?

$$B = 0.01$$

$$L = 0.75$$

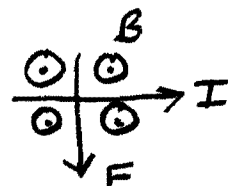
$$I = 15$$

$$F = ?$$

$$F = BIL$$

$$F = (0.01)(15)(0.75)$$

$$F = 0.113 \text{ N}$$



5. A horizontal copper wire 40 cm long with a weight of 0.35 N carries a current of 8.0A to the right. Determine the strength and direction of the magnetic field required to balance the force of gravity on the wire.

$$F = BIL$$

$$B = \frac{F}{IL} = \frac{0.35}{8(0.4)}$$

$$F = 0.35 \text{ N}$$

$$I = 8 \text{ A}$$

$$L = 0.4 \text{ m}$$

$$B = 0.11 \text{ T}$$

