

CLASS EXERCISE #11 - 5 July 2005

(1) Consider the six mutually-perpendicular directions north, east, south, west, up, and down.

Determine the direction of the magnetic force on a current segment for these cases:

(a) Current is north, magnetic field is east

By the right-hand rule, the force is down.

(b) Current is south, magnetic field is up

The force is towards the west.

(c) Magnetic field is south, current is down

The force is towards the west.

(2) A negative charge, $q = -3\mu\text{C}$, is moving to the east at 30 m/s in a magnetic field of 0.40 T directed north. Determine the magnitude and direction of the magnetic force on the charge.

By the right-hand rule, since the current is west (negative charge moving east) and the magnetic field is north, the force is directed down (\otimes). Its magnitude is

$$\begin{aligned} F &= |q|vB \\ &= (3.0 \times 10^{-6} \text{ C})(30 \text{ m/s})(0.40 \text{ T}) \\ &= 3.6 \times 10^{-5} \text{ N.} \end{aligned}$$