<u>Extra practice</u>: Right-hand rule.

Please use these exercises if you don't feel absolutely comfortable and completely confident with the right-hand rule.

The force acting on a charge q (taken with the account of its sign) moving with a velocity $\vec{v}$ in a magnetic field $\vec{B}$ is:

$$\vec{F} = q\,\vec{v} \times \vec{B}$$

The cross product of two vectors produces another vector. Its magnitude is calculated as

$$|\vec{F}| = |q||\vec{v}||\vec{B}|\sin\theta$$

where θ is the angle between the velocity of the particle and the magnetic field, and its direction is defined by the right-hand rule. Here we practice just getting the direction of the force from the right-hand rule.

What is the direction of the force in the following situations?

a) If a positive charge travels to the right and the magnetic field is into the page

b) If a negative charge travels to the right and the magnetic field is into the page

c) If a positive charge travels out of the page and the magnetic field is to the left

d) If a negative charge travels to the left and a magnetic field is pointing downward

e) If a charge is travelling to the left and the magnetic field points to the left

What is the direction of the magnetic field in the following situations?

a) A positively charged particle travelling to the right experiences an upward force

b) A negatively charged particle travelling downward experiences a force out of the page

Answers are on the next page.

Answers:

What is the direction of the force in the following situations?

a) If a positive charge travels to the right and the magnetic field is into the page (up)

b) If a negative charge travels to the right and the magnetic field is into the page (down)

c) If a positive charge travels out of the page and the magnetic field is to the left (down)

d) If a negative charge travels to the left and a magnetic field is pointing downward (into the page)

e) If a charge is travelling to the left and the magnetic field points to the left (zero force)

What is the direction of the magnetic field in the following situations?

a) A positively charged particle travelling to the right experiences an upward force (into the page)

b) A negatively charged particle travelling downward experiences a force out of the page (left)