Practice Right Hand Rule #1

Remember: $\mathbf{F}_B = q\mathbf{v} \times \mathbf{B}$

What direction is the force on a positive charge when entering a uniform $\mathbf{B}$ field in the direction indicated?

1) up
2) down
3) left
4) right
5) into page
6) out of page
7) there is no net force
Practice Right Hand Rule #1

(5) the force is into the page

Using your right hand, thumb along \( \mathbf{v} \), fingers along \( \mathbf{B} \), palm into page
Practice Right Hand Rule #2

Remember: \( \vec{F}_B = q\vec{v} \times \vec{B} \)

What direction is the force on a positive charge when entering a uniform \( B \) field in the direction indicated?

1) up
2) down
3) left
4) right
5) into page
6) out of page
7) there is no net force
Practice Right Hand Rule #2

(6) Force is out of the page

\[ \begin{align*}
q & \qquad \rightarrow \qquad v \\
& \uparrow \quad B
\end{align*} \]
Practice Right Hand Rule #3

What direction is the force on a positive charge when entering a uniform B field in the direction indicated?

1) up
2) down
3) left
4) right
5) into page
6) out of page
7) there is no net force
Practice Right Hand Rule #3

(1) The force on the positive charge is up
Hall Effect

A conducting slab has current to the right. A B field is applied out of the page. Due to magnetic forces on the charge carriers, the bottom of the slab is at a higher electric potential than the top of the slab.

\[
\begin{align*}
\text{V} & > \text{V(Top)} \\
\end{align*}
\]

On the basis of this experiment, the sign of the charge carriers that make up the current in the slab is:
1) positive
2) negative
3) cannot be determined
Hall Effect

(1) The carriers are positive

Look at the force on the carriers. If positive, they are flowing to the right, and $\vec{F}_B = q\vec{v} \times \vec{B}$ will be down. If negative they are flowing to the left and $\vec{F}_B = q\vec{v} \times \vec{B}$ will be down (don’t forget the sign of $q$!) So either way the force is down. But we know that the result is a higher potential at the bottom – positive charges are moving down. So the carriers are positive.
Rail Gun

A bar is free to slide on two parallel rails. A current I flows through the bar in the direction shown. An external magnetic field points out of the page. The bar in the center of the figure will:

1) move left
2) move right
3) stay in place
Rail Gun

(2) The rail will move to the right

\[ \vec{F}_B = I \vec{l} \times \vec{B} \], and up cross out is right