Magnetic fields, \( \mathbf{B} \)

- Features
- Force
- Sources
LORENTZ FORCE
A proton (q=+e) is released from rest in a uniform \( \mathbf{E} \) and uniform \( \mathbf{B} \). \( \mathbf{E} \) points up, \( \mathbf{B} \) points into the page. Which of the paths will the proton initially follow?

E. It will remain stationary

(To think about: what happens after longer times?)
A + charged particle moving up (speed \(v\)) enters a region with uniform \(B\) (left) and uniform \(E\) (into page).

What’s the direction of \(\mathbf{F}_{\text{net}}\) on the particle, at the instant it enters the region?

A. To the left
B. Into the page
C. Out of the page
D. No net force
E. Not enough information
A proton (speed $v$) enters a region of uniform $\mathbf{B}$. $\mathbf{v}$ makes an angle $\theta$ with $\mathbf{B}$.

What is the subsequent path of the proton?

A) Helical
B) Straight line
C) Circular motion, $\perp$ page. (plane of circle is $\perp \mathbf{B}$)
D) Circular motion $\perp$ page. (plane of circle at angle $\theta$ w.r.t. $\mathbf{B}$)
E) Impossible. $\mathbf{v}$ should always be $\perp \mathbf{B}$
A wire loop in a B field has a current I. The B-field is localized, it’s only in the hatched region, roughly zero elsewhere.
Which way is I flowing to hold the mass in place?

A) CW
B) CCW
C) You cannot “levitate” like this!
A wire loop in a B field has a current I. The mass is "levitated" by the magnetic force $F_{\text{mag}} = ILB$. If you increase the current, does the magnetic force do positive work on the mass?

A) Yes
B) No