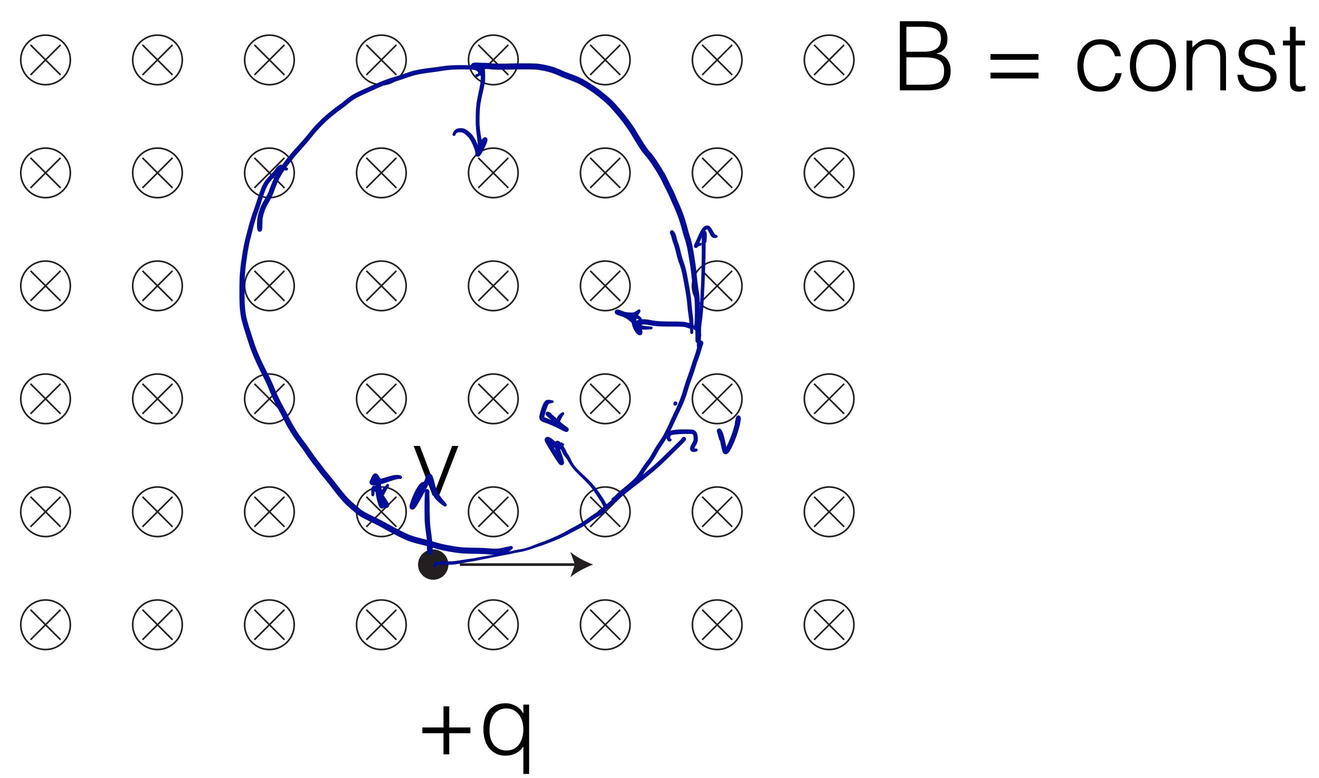
Applying the Lorentz Force Law

- Lorentz Force Law:

$$\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$$

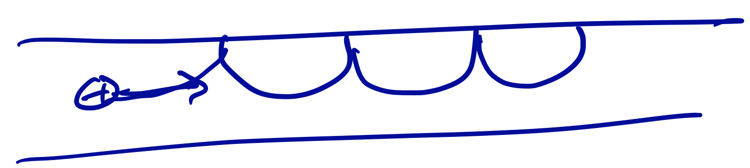


Lorentz Force Law

- Force on moving charges:

$$\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$$

- Force on wires carrying current:



$$\sum \vec{F}_q = \left(\sum q\right)\vec{v} \times \vec{B}$$

- Result:

$$\vec{F} = I\vec{L} \times \vec{B}$$

Torque on a closed loop

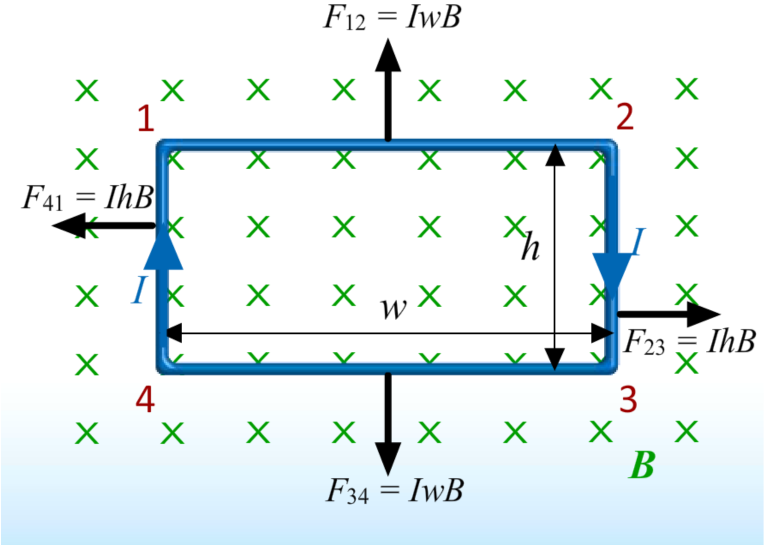
- Compute the torque on a closed loop.

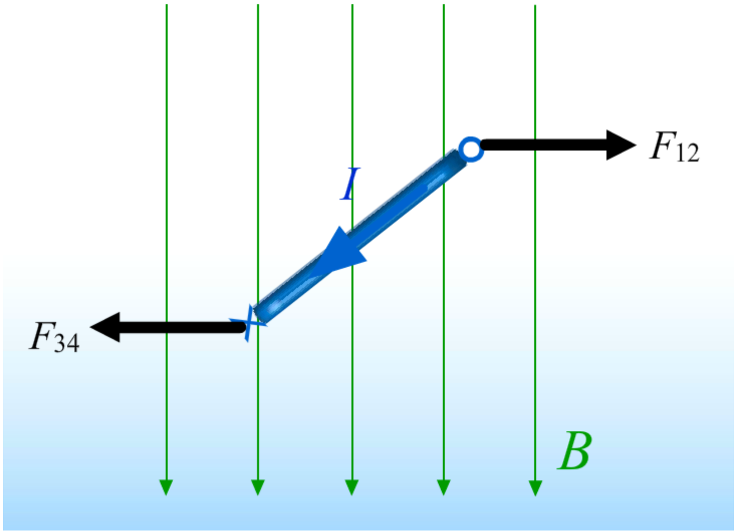
$$\vec{F} = I\vec{L} \times \vec{B} \qquad \vec{\tau} = \vec{r} \times \vec{F}$$

- (Overhead)

- Result:

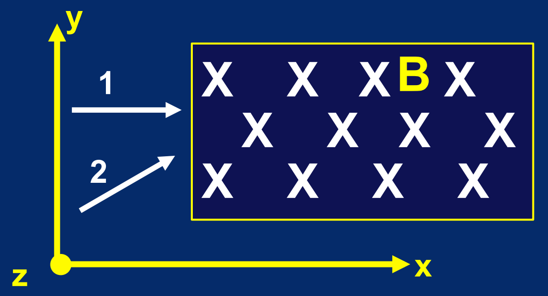
$$\vec{\tau} = N\, I\, A\, \hat{n} \times \vec{B}$$





Two protons each move at speed v toward a region of space which contains a constant B field in the –z direction.

- *What is the relation between the magnitudes of the forces on the two protons in the magnetic field region?*

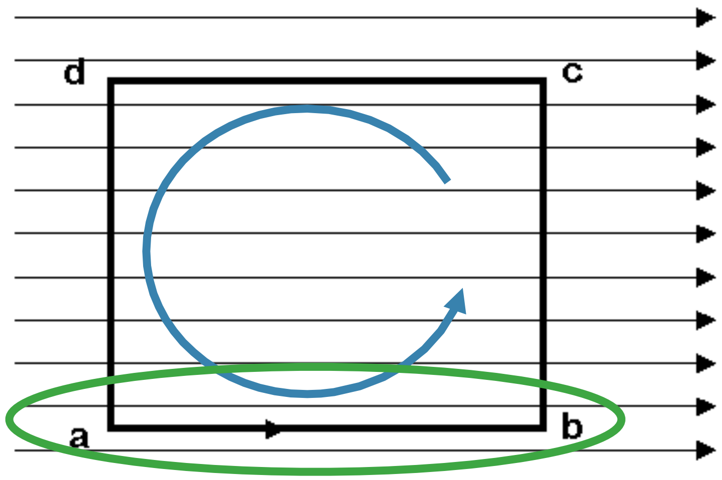


(a) $F_1 < F_2$ (b) $F_1 = F_2$ (c) $F_1 > F_2$

Clicker 17-2

A square loop of wire is carrying current in the counterclockwise direction. A horizontal uniform magnetic field points to the right

C: 18-1

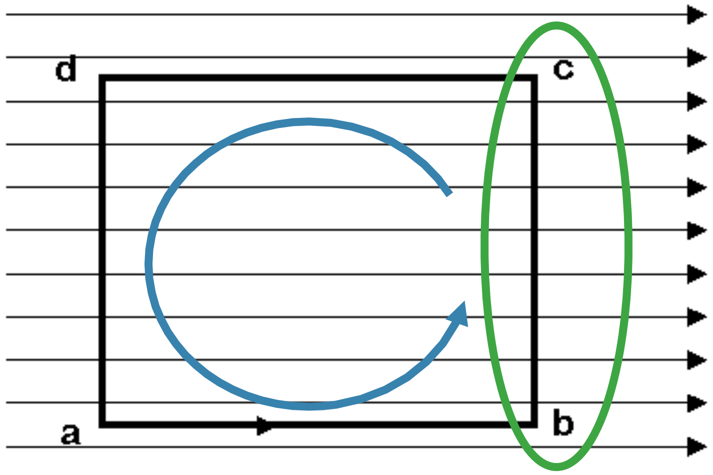


What is the force on section a-b of the loop ?

A) zero B) out of the page C) into the page D) Up E) Down

A square loop of wire is carrying current in the counterclockwise direction. A horizontal uniform magnetic field points to the right

C: 18-2

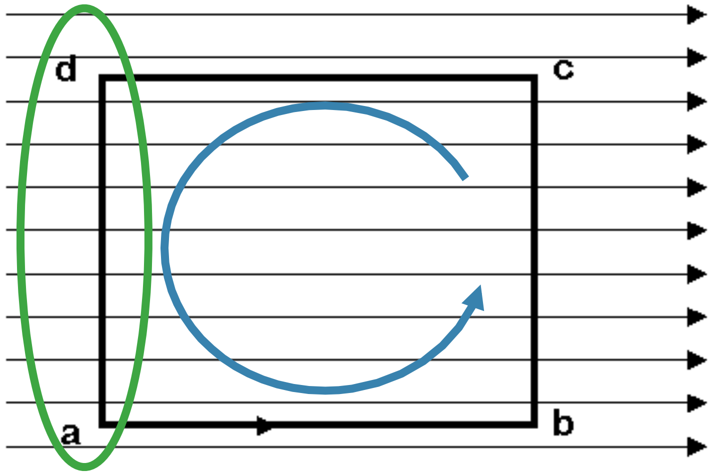


What is the force on section b-c of the loop ?

A) zero B) out of the page C) into the page D) Up E) Down

A square loop of wire is carrying current in the counterclockwise direction. A horizontal uniform magnetic field points to the right

C: 18-3



What is the force on section d-a of the loop ?

A) zero B) out of the page C) into the page D) Up E) Down