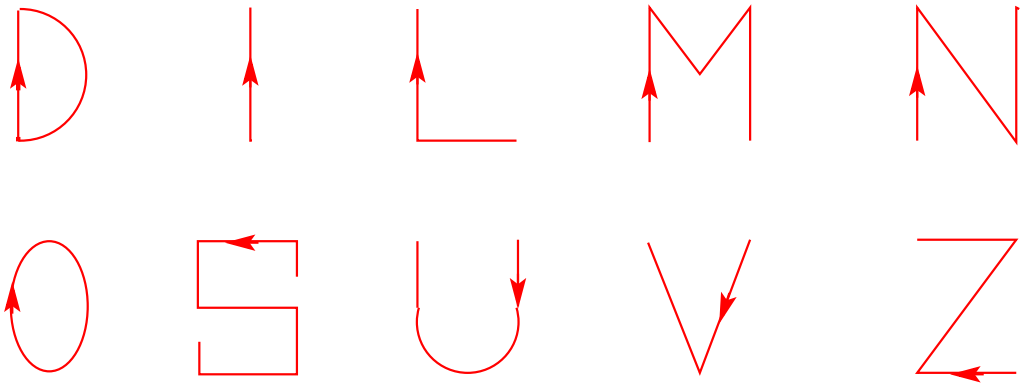
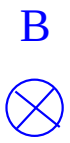
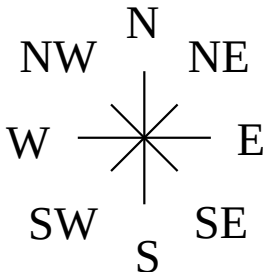
Magnetic Force Application (6)

An electric current flows through each of the letter-shaped wires in a region of uniform magnetic field pointing into the plane.

- Find the direction of the resultant magnetic force on each letter.





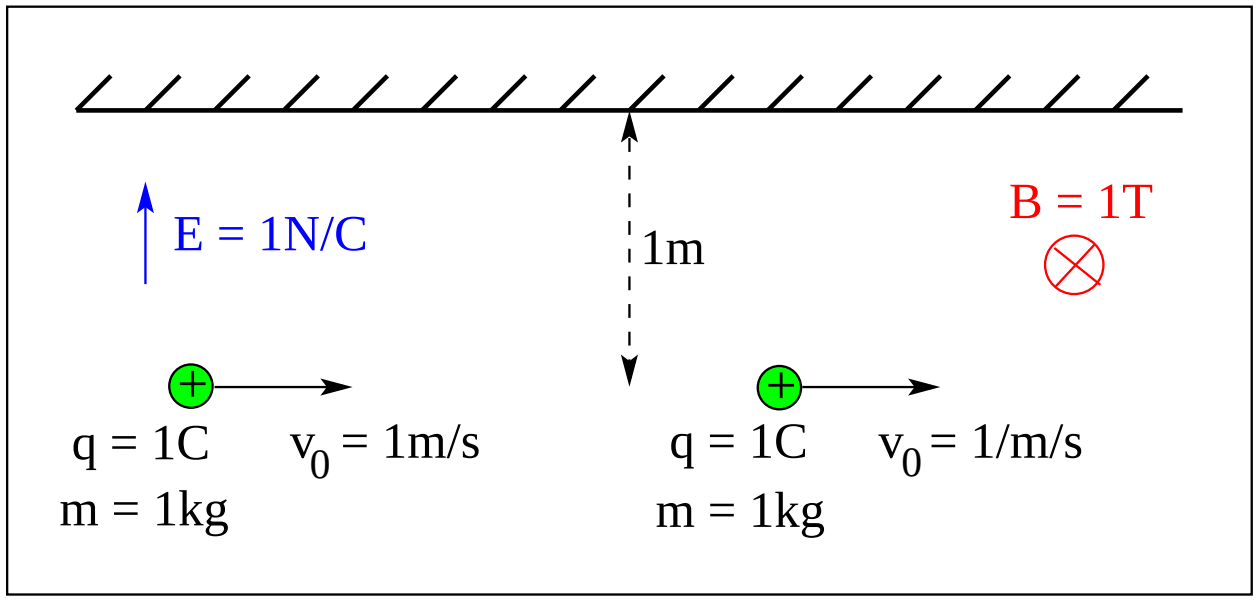


Magnetic Force Application (9)

Two charged particles are released in different uniform fields. Ignore gravity.

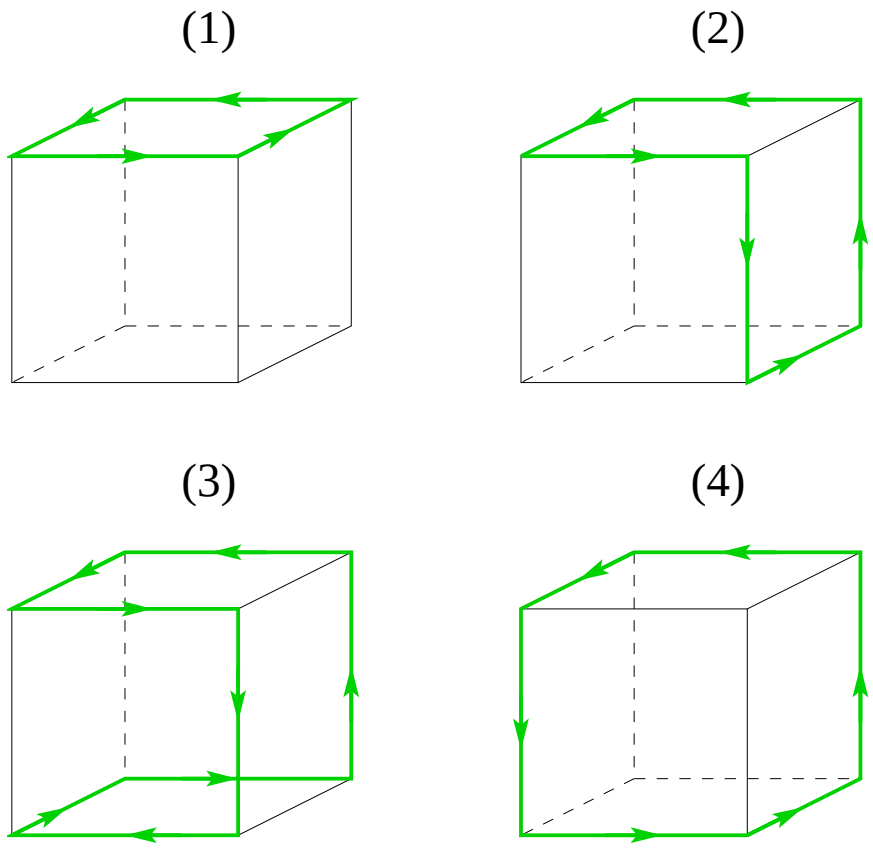
(a) Find the the horizontal velocity components v_{Ex}, v_{Bx} and the vertical velocity components v_{Ey}, v_{By} at the instant each particle hits the wall.

(b) Find the times t_E, t_B it takes each particle to reach the wall.



Magnetic Force Application (11)

If the magnetic moment of the current loop (1) is $\mu_1 = 1\text{Am}^2$, what are the magnetic moments μ_2, μ_3, μ_4 of the current loops (2), (3), (4), respectively?

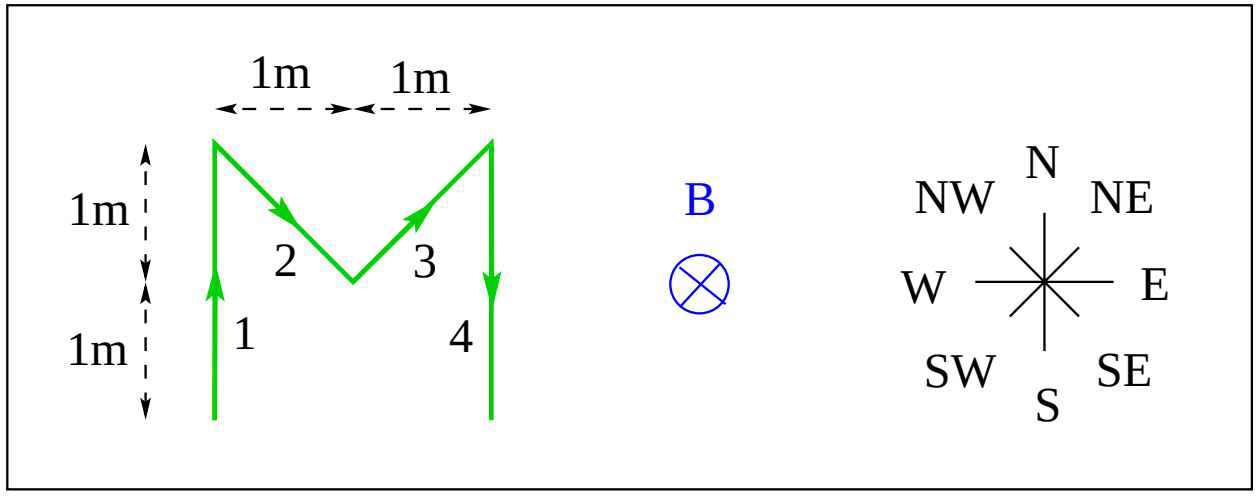


Magnetic Force Application (12)

An electric current $I = 1$A flows through the M-shaped wire in the direction indicated. The wire is placed in a magnetic field $B = 1$T pointing into the plane.

(a) Find the magnitude of the magnetic forces F_1, F_2, F_3, F_4 acting on each part of the wire.

(b) Find the direction of the resultant force $\vec{F} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$ acting on the wire.



Magnetic Force Application (10)

A triangular current loop is free to rotate around the vertical axis PQ.

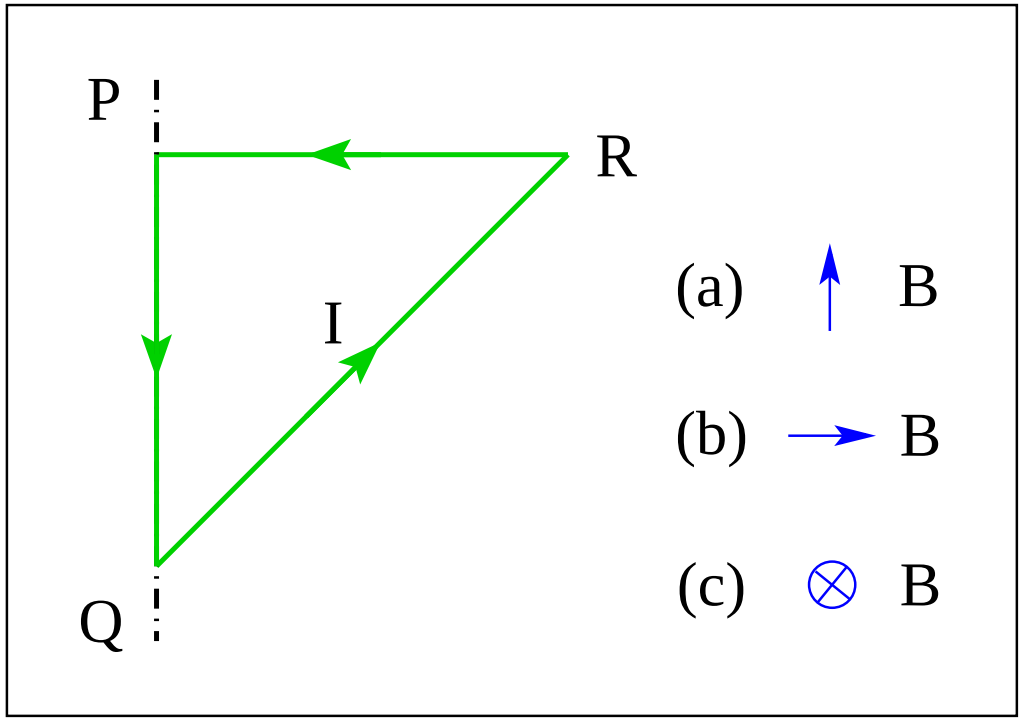
If a uniform magnetic field $\vec{B}$ is switched on, will the corner R of the triangle start to move out of the plane, into the plane, or will it not move at all?

Find the answer for a field $\vec{B}$ pointing

(a) up,

(b) to the right,

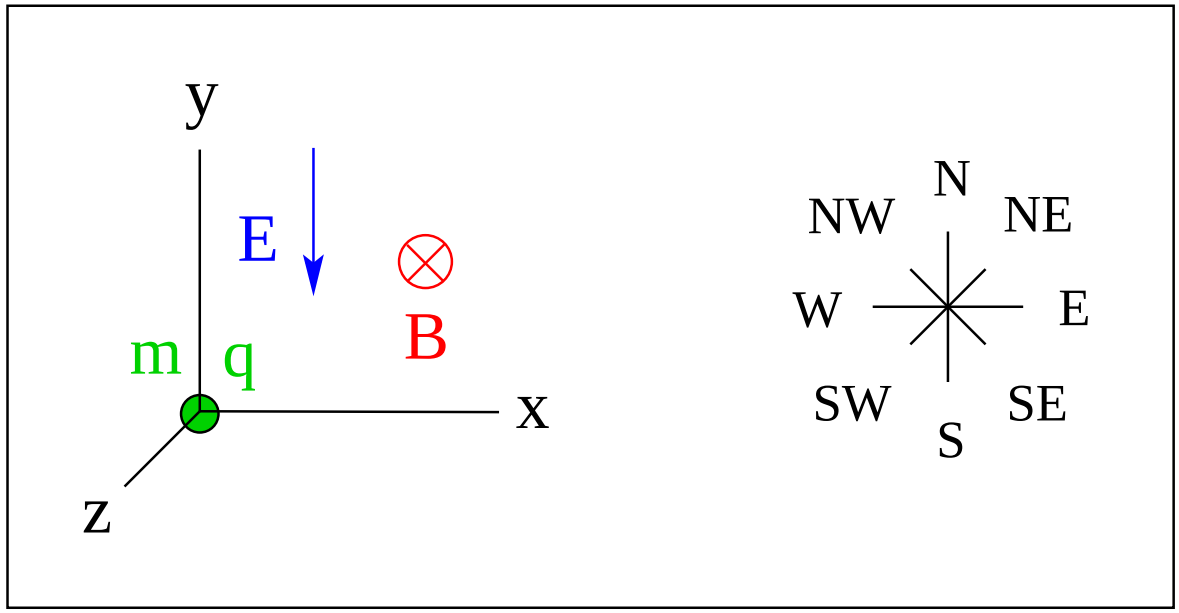
(c) into the plane.



Magnetic Force Application (8)

A negatively charged particle $(q < 0)$ is released from rest in a uniform electric field $\vec{E}$ pointing down and a uniform magnetic field $\vec{B}$ pointing into the plane.

- In which direction relative to the origin of the coordinate system will the particle be located after a very long time?



Magnetic Force Application (13)

Consider a current loop with magnetic moment $\vec{\mu}$ in a uniform magnetic field $\vec{B}$.

(a) At what angle θ is the potential energy $U = -\vec{\mu} \cdot \vec{B}$ a maximum?

(b) At what angle θ does the loop experience the strongest torque $\vec{\tau} = \vec{\mu} \times \vec{B}$?

(c) If the loop is free to rotate and released from rest in the orientation shown, sketch the angle θ as a function of time.