

CONCEPT: FORCE ON MOVING CHARGES AND THE RIGHT-HAND-RULE

- A charge moving through an existing Magnetic Field FEELS a Magnetic FORCE:

- MAGNITUDE → _____

- AKA Lorentz _____.

- Angle θ is between _____ and _____

- UNIT of B-Field is TESLA ($1 \text{ T} = 1 \text{ N} / \text{A m}$)

EXAMPLE 1: When a 2 C charge moves perpendicular to a constant magnetic field with 3 m/s, it feels a force of 4 N. What must the magnitude of the magnetic field be?

- ALL DIRECTIONS in Magnetism problems will come from variations of the RIGHT HAND RULE (RHR).

- WARNING: Different versions → Pick one and stick with it. If different from mine or your professor, double-check!

- In 2D, we have Up/Down and Left/Right. In 3D, we need 2 more:

(1) AWAY from you = [INTO / OUT OF] the page/plane → Symbol:

(2) TOWARDS you = [INTO / OUT OF] the page/plane → Symbol:



- Fingers = _____

- Thumb = _____

- Palm = _____

- RHR works for POSITIVE charges. For NEGATIVE charges, we use the LEFT Hand (same rule, different hand).

EXAMPLE 2: Find the direction of the Magnetic Force on a moving charge in each of the following situations:

(a) proton moving left in a B-Field pointing up

(b) electron moving down in a B-Field pointing out of page

(c) electron moving down in a B-Field pointing left

(d) proton moving into the page in a B-Field pointing right

EXAMPLE: FORCE ON CHARGE MOVING AT AN ANGLE

What is the magnitude and direction of the magnetic force on a $+3\text{ C}$ charge moving at 4 m/s when it first enters a 5 T magnetic field that is directed along the positive x -axis if the charge is initially moving:

(a) in the positive y axis

(b) in the negative x axis

(c) in a direction that makes 30° with the $+y$ axis