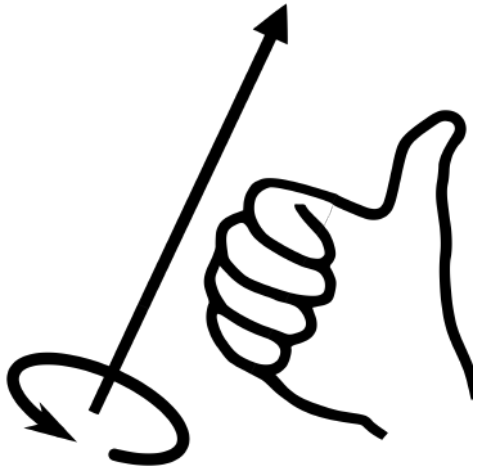
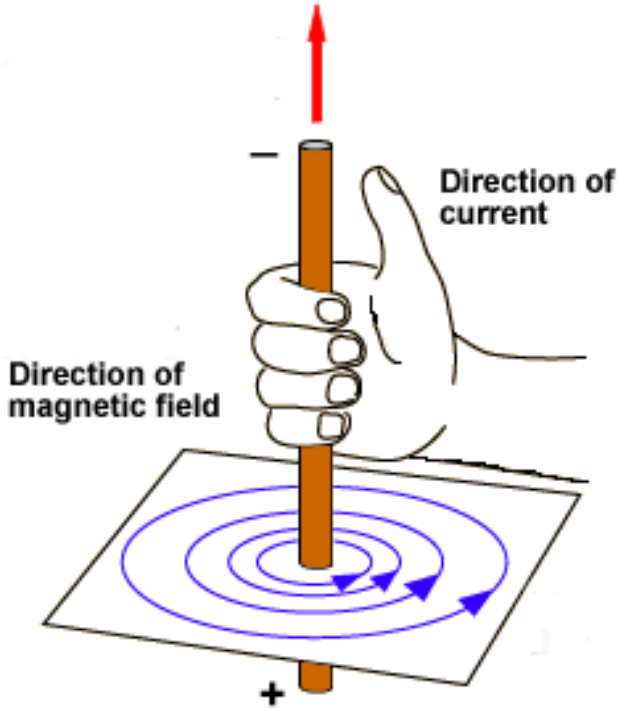
Right Hand Rules



RHR #1 - Straight Wire



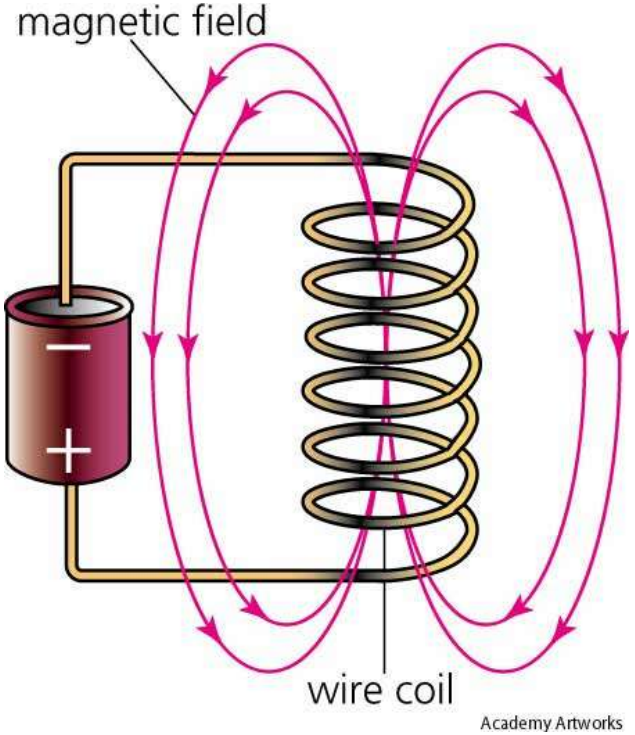
Thumb: direction of current (from + to -)

Fingers: curl in direction of magnetic (B) field (clockwise, counterclockwise)

RHR #2: Solenoids

What is a solenoid?

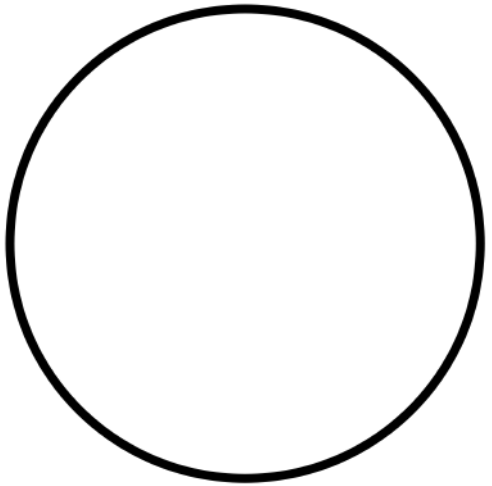
Cylindrical coil of wires that produces a magnetic field when a current runs through it.



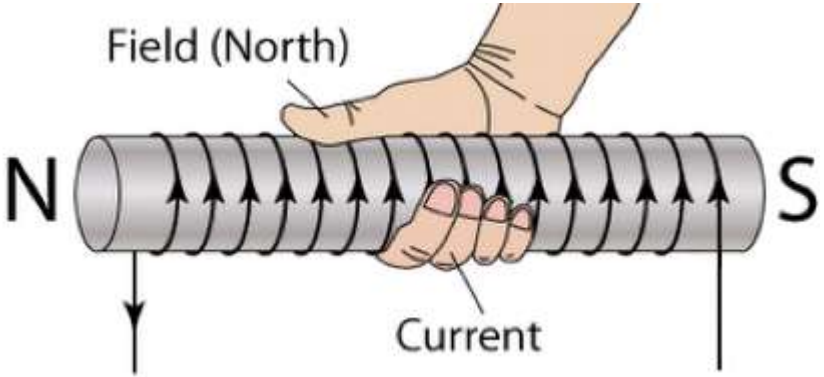
RHR #2: Solenoids

How does running a current through a solenoid create a magnetic field?

Think of RHR #1



RHR #2: Solenoids



Fingers: curl in direction of current

Thumb: points towards the North Pole

RHR #3: Moving Charge

Three players:

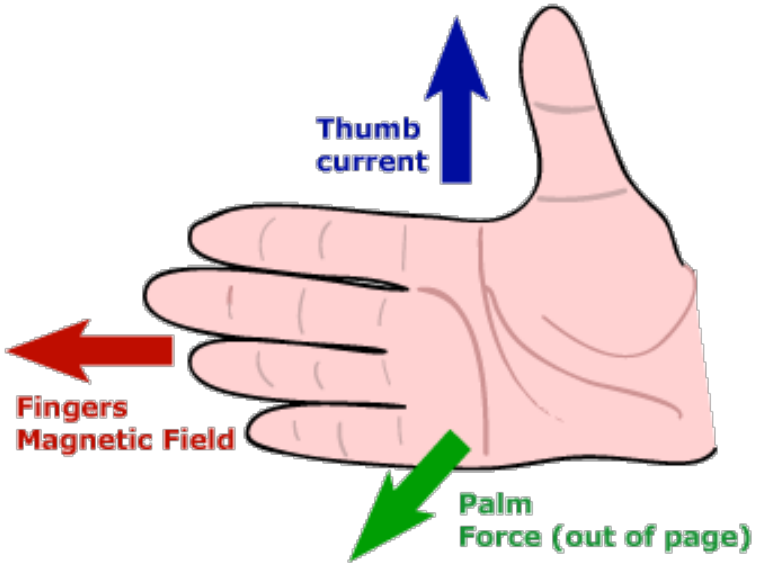
1. Electron(s) or Proton(s) with Velocity
2. Magnetic Field
3. Deflection Force

Rules:

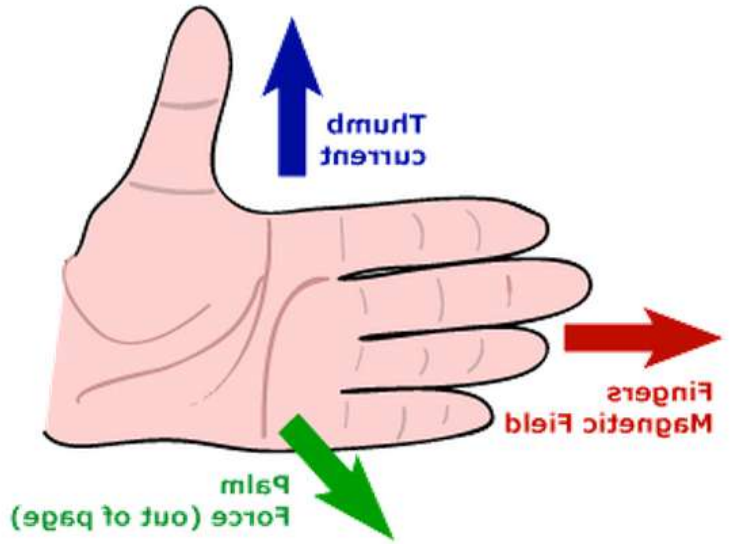
1. All have to be perpendicular (right angles) to each other.

RHR #3: Particle Deflection

Right hand: Protons



Left hand: Electrons

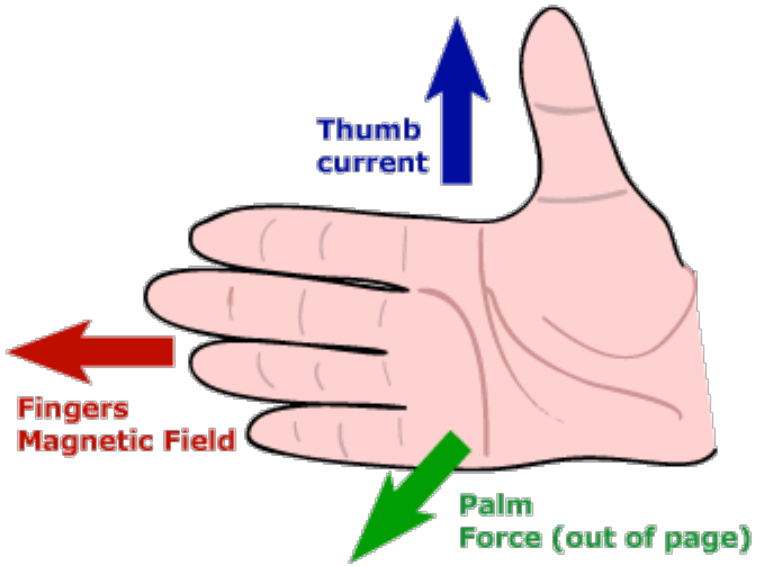


RHR #3: Particle Deflection

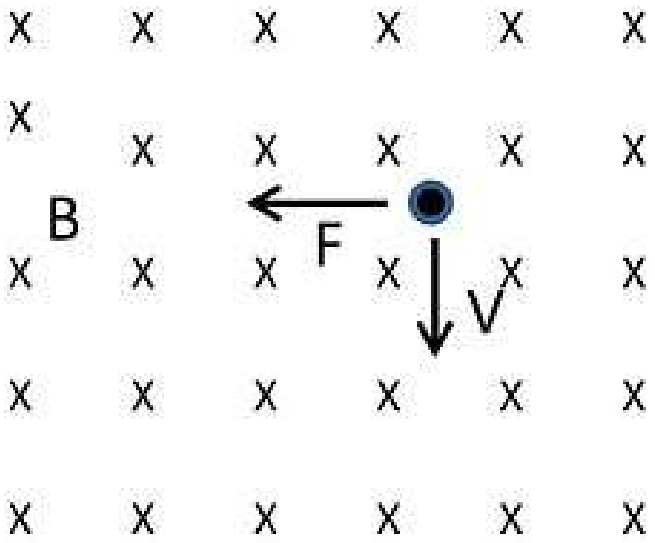
Thumb: Direction of current or velocity of particle

Fingers: Direction of magnetic field

Palm: Deflection force



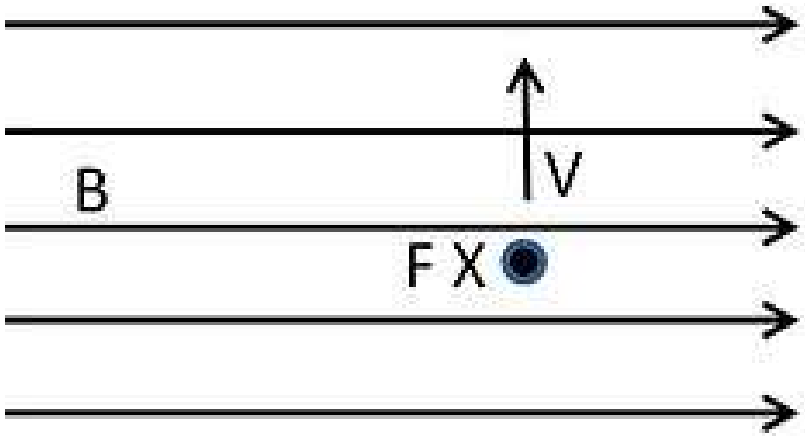
RHR #3: Particle Deflection



The magnetic force and velocity vectors are shown for a charged particle moving through the magnetic field.

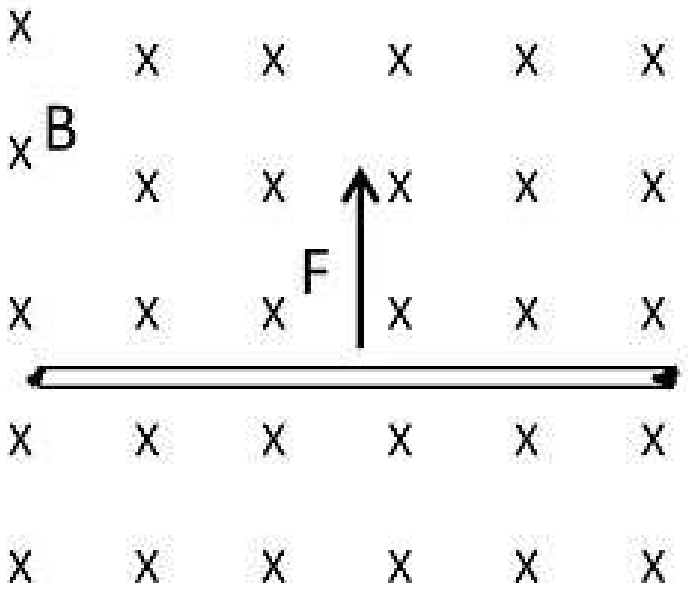
What sign is the charge?

RHR #3: Particle Deflection



What is the charge on the moving particle?

RHR #3: Particle Deflection



The magnetic force vector direction is shown for a current-carrying wire in a magnetic field.

What direction is the current?

Equations for RHR #3

Force on a current-carrying wire:

$F = BIL$

B= magnetic field strength (measured in teslas, T)
I= current (Amps)
L = length of wire (meters)

Force on a charged particle:

$F = Bvq$

B= magnetic field strength (measured in teslas, T)
v= velocity of the particle (m/s)
q= charge of the particle (Coulombs)

Force on a wire

The current through a wire that is 0.82 m long is 5.0 A. The wire is perpendicular to a 0.55 T magnetic field. What is the magnitude of the force on the wire?

Force on a moving charge

A beam of electrons moves at right angles to a magnetic field of 4.9×10^{-2} T. The electrons have a velocity of 2.5×10^{6} m/s. What is the magnitude of the force on each electron?