Magnetic Field

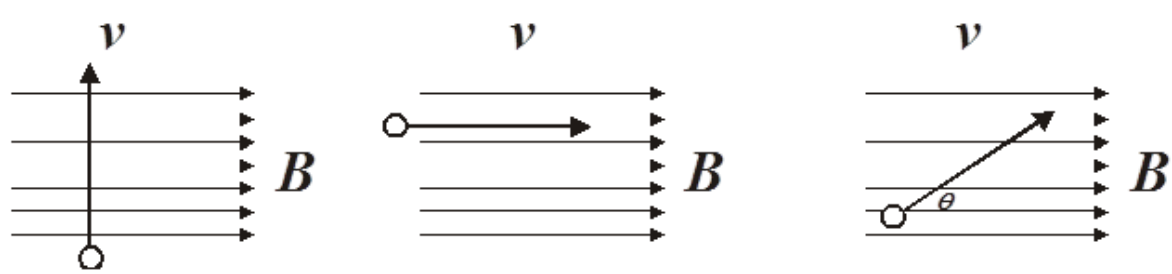
We found, experimentally, that only moving and charged particles are deflected by a magnetic field $\left(\vec{B}\right)$. If the particle moves faster or has a greater charge, the greater the deflection.

$$\text{ie}: \ \vec{F_B} \propto \vec{v}q$$

Now we just need to figure out the proportionality constant. This is the strength of the magnetic field $\left(\vec{B}\right)$.

$$\text{ie}: \ \vec{F_B} = \vec{B}\vec{v}q$$

Where $\vec{B}$ is measured in Teslas (T).



Max force on particle v is perpendicular to B | *Zero force on particle v is parallel to B* | *Particle v makes angle with B*

Only the perpendicular component can will contribute to the deflection of the particle. In order to find this we use Vector Decomposition! YaY

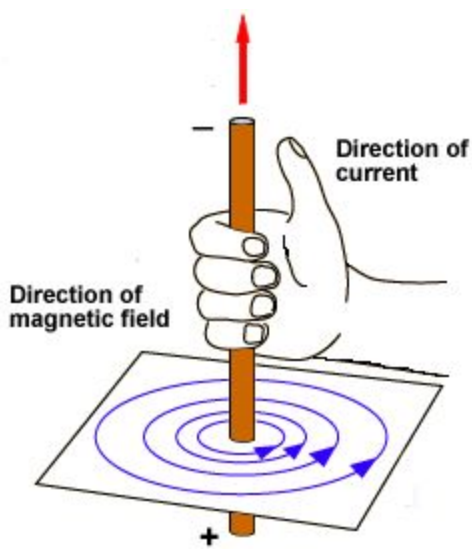
Which trig function makes sense to use after $\vec{F_B} = \vec{B}\vec{v}q$?

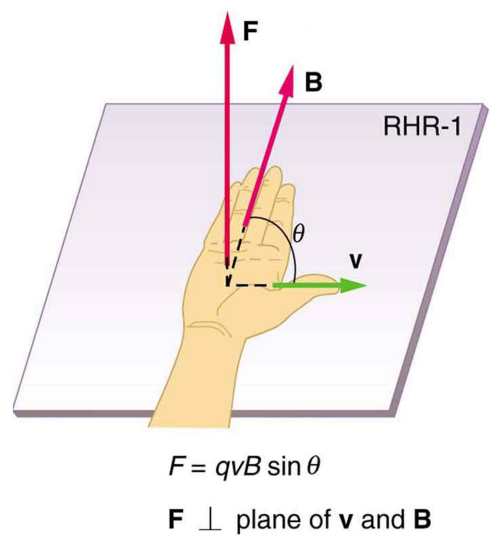
A proton travels at 22° to a magnetic field of strength 2.2μT at a velocity of 0.22×10^5m/s. What is the magnitude of the force acting on the particle?

Hint: 2.9×10^{-21}N

...but in which direction is that force?

We have the magnetic, and the electric right hand rule…





Last thing for today: Solenoids

Solenoids are proportional to the number of turns and the current running through them. They are inversely proportional to the length of the solenoid.

$\vec{B} = \frac{\mu_0 N i}{L}$ where μ_0 is the permeability of free space. (*I just love saying "multiply by the permeability of free space") and has a value of $\mu_0 = 4\pi \text{x} 10^{-7} \frac{Tm}{A}$.

3 quick check problems on pg 277.