CHARGE

CURRENT.

Gauss's Law

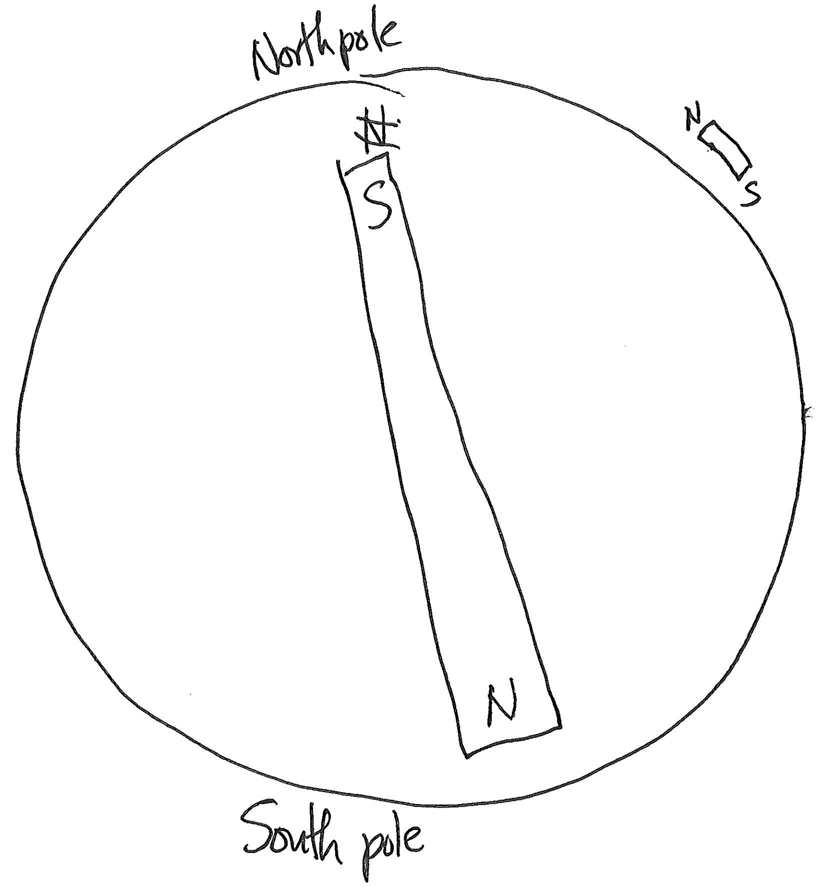
$$\varepsilon_0 \Phi = Q_{in}.$$

$$\varepsilon_0 \oint \vec{E} \cdot d\vec{A} = Q_{in}$$

$$\nabla \cdot \vec{E} = \rho$$

$$\nabla \cdot \vec{E}(\vec{r}) = \rho(\vec{r}).$$

Maxwell's
First Eq. ~~#~~

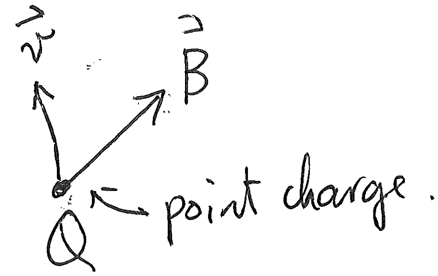


$$\vec{A}\times(\vec{B}\times\vec{C}) \neq (\vec{A}\times\vec{B})\times\vec{C}.$$

$\otimes$

Gauss's Law for magnetic field:

$$\underbrace{\oint \vec{B} \cdot d\vec{A} = 0 \qquad \nabla \cdot \vec{B} = 0.}_{\text{Maxwell's second Equation.}}$$



Lorentz Eq. $\longrightarrow$ $\vec{F}_B = Q\vec{v}\times\vec{B}$.

Unit is T (Tesla).

$$N = C\cdot\frac{m}{s}\cdot T$$

$$T \equiv \frac{Ns}{mC} \equiv \frac{Kg}{sC}.$$

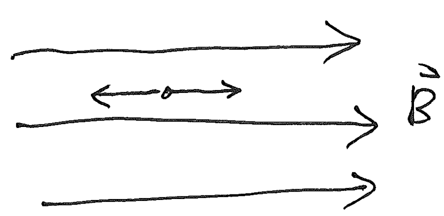
Not a fundamental unit.

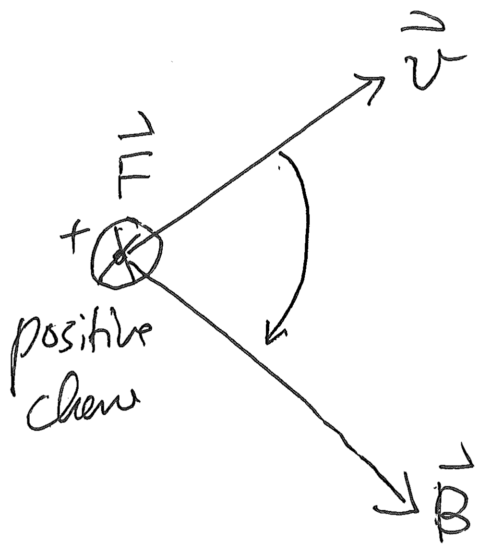
$$|\vec{F}_B| = Q|\vec{v}||\vec{B}|\sin\theta.$$

$|\vec{F}_B| = 0$ if $|\vec{v}| = 0$

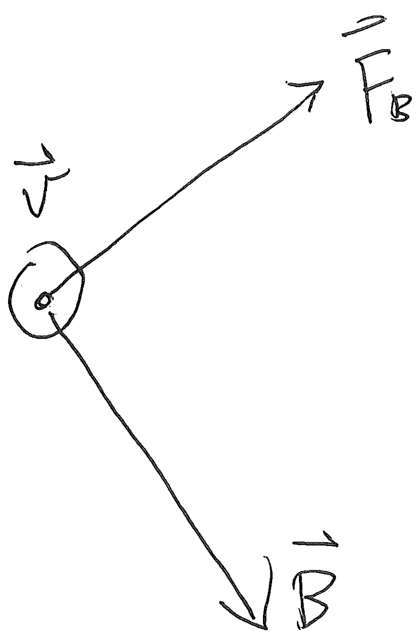
$|\vec{F}| = 0$ if $\sin\theta = 0$.

$\theta = 0^\circ$ or 180°.





$\vec{v}$
$\vec{F}$
+
positive
charge
$\vec{B}$



$\vec{F}_B$
$\vec{v}$
$\vec{B}$

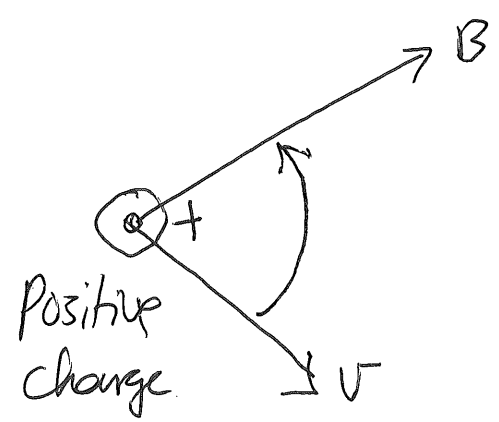
$\because \vec{F}_B = q\vec{v} \times \vec{B}$

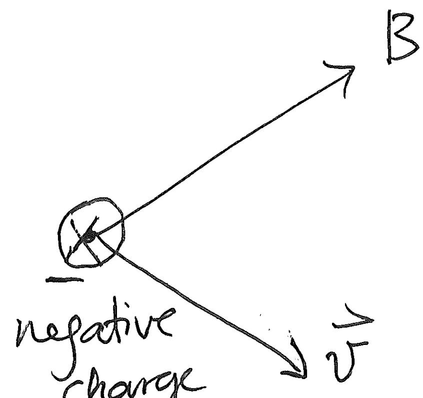
$\therefore \vec{F}_B \perp$ to both $\vec{v}$ and $\vec{B}$.

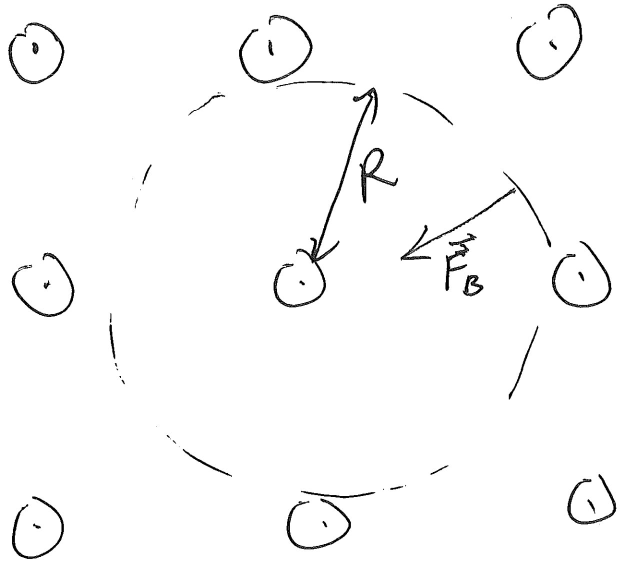
Power of work done by $\vec{F}_B$

$= \vec{F}_B \cdot \vec{v}$

$= |\vec{F}_B| \cdot |\vec{v}| \underbrace{\cos 90^\circ}_{=0} = 0.$







Equation of motion:

$$\vec{F} = ma$$

$$qvB = m\frac{v^2}{R}$$