Admin:

- Virtual lectures
- labs (no new labs, try to make up)
- HW (digitally) (Scanner App, Scannable, Genius Scan)
- Quizzes: Still in-class; scan + submit after class
- Virtual office hours
- Exam 2 (take home)
- Rest of semester
  Ch 20, 21, 22, take home final
- Review session Ch 17-19
  (virtual) (18-19)

Where are we?

Core Concepts

Charges $\longrightarrow$ Fields

Ch 13-16: Electric field + Force

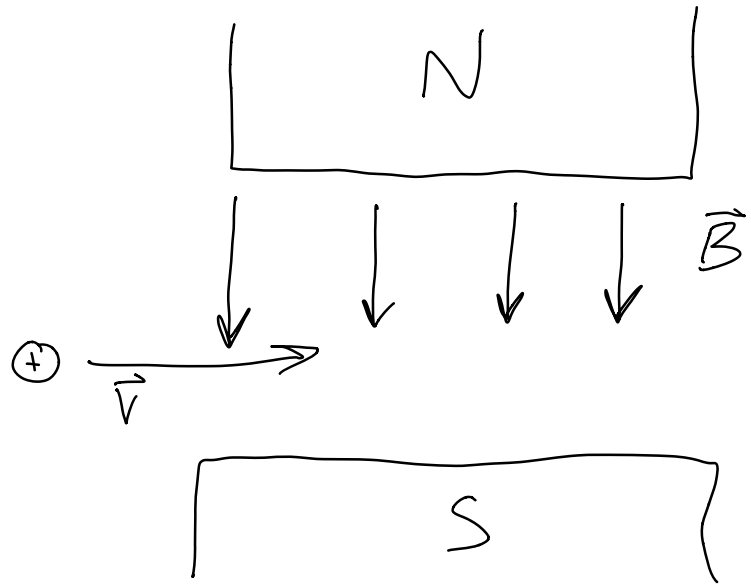
Ch 17: Magnetic Field

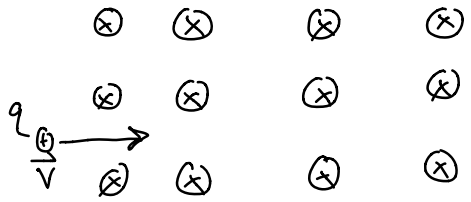
Ch 18-19: Applications of $\vec{E}$ to circuits

Ch 20: Magnetic Force

How does a charge q:

	Create a field	React to a field
Electric Field	$\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}\hat{r}$	Force $\vec{F} = q\vec{E}$
Magnetic Field	$\vec{B} = \frac{\mu_0}{4\pi}\frac{q\vec{v}\times\hat{r}}{r^2}$	$\vec{F} = q\vec{v}\times\vec{B}$





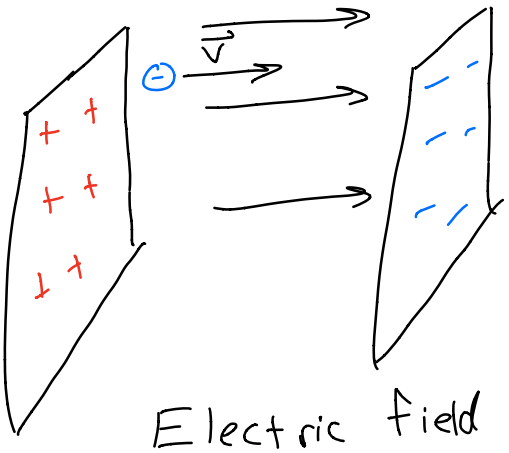
What direction is $\vec{F}$?

↑

$\vec{F} = qvB\,\hat{y}$

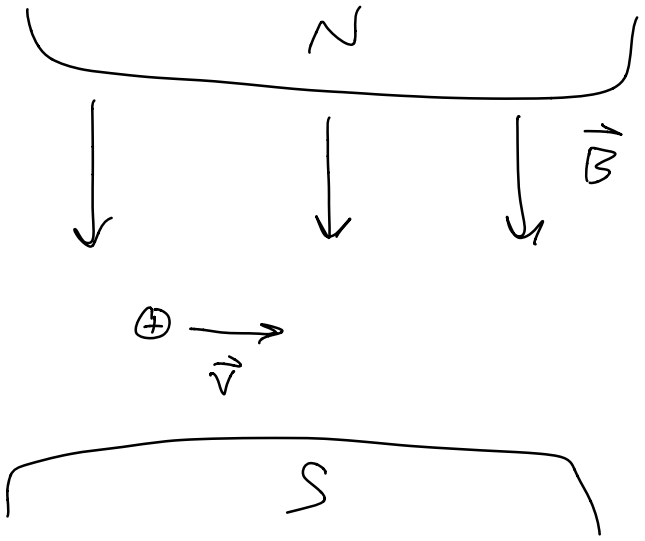
- Things to note:

$|\vec{v}|$ does not change, only the direction



Electric field will slow or speed up the particle

$$\Delta K = \vec{F} \cdot \Delta \vec{s} = q\vec{E} \cdot \Delta \vec{s} = -q\Delta V$$



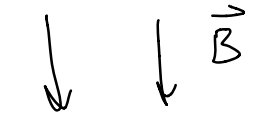
$$\Delta K = \vec{F} \cdot \Delta \vec{s}$$

$$= q \vec{v} \times \vec{B} \cdot \Delta \vec{s}$$

$$\Delta \vec{s} = \vec{v} \Delta t$$

$$\Delta K = q \vec{v} \times \vec{B} \cdot \vec{v} \Delta t$$

$$\Delta K = q \Delta t (\vec{v} \times \vec{B}) \cdot \vec{v}$$



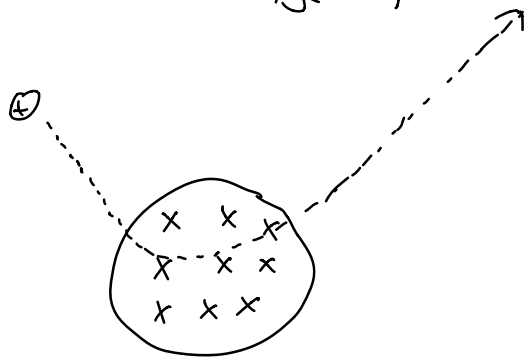
⊕ ⟶

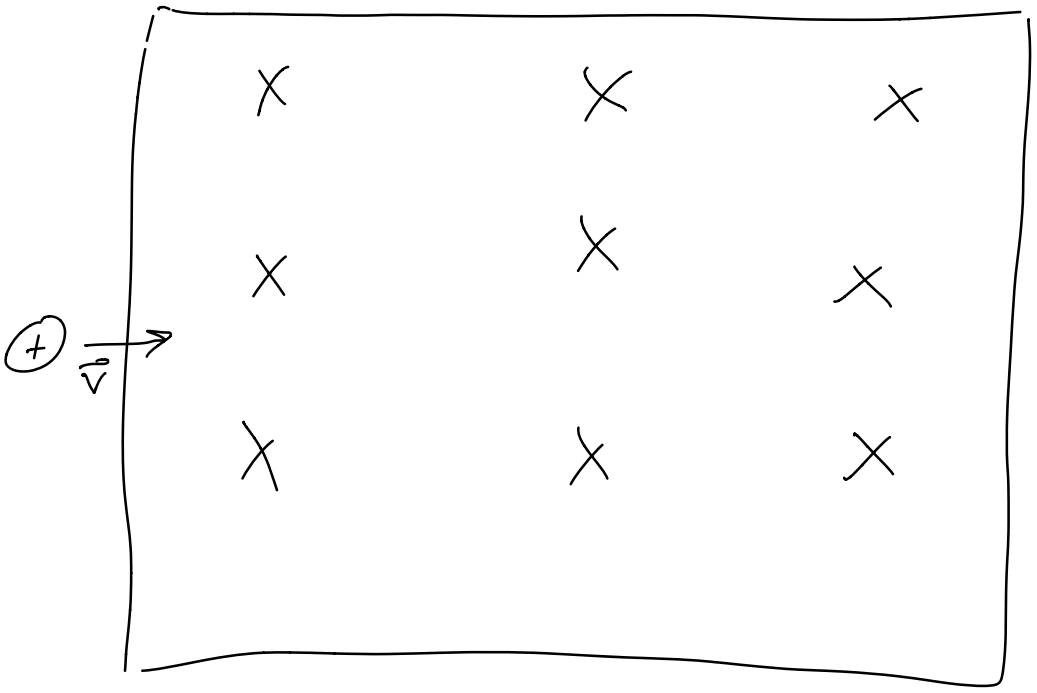
$\vec{v} \times \vec{B}$ is ⊗

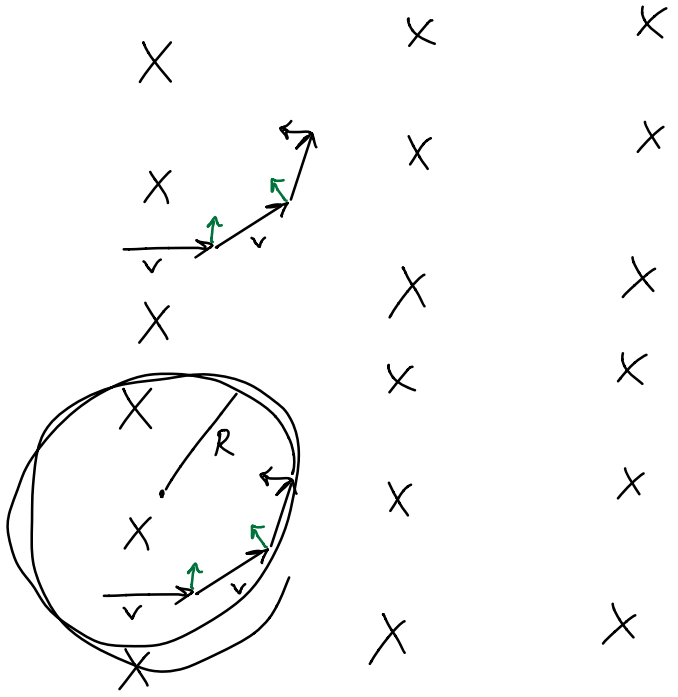
so $(\vec{v} \times \vec{B}) \cdot \vec{v}$ is 0

$\vec{B}$ only deflects

it does not change ~~speed~~




+
$\vec{v}$


v
v
R
v
v

$$\frac{mv^2}{R} = qvB$$

$$R = \frac{mv^2}{qvB} = \frac{mv}{qB}$$

$$T = \frac{2\pi R}{v} = \frac{2\pi}{v}\frac{mv}{qB} = 2\pi\frac{m}{qB}$$