

# Magnetism

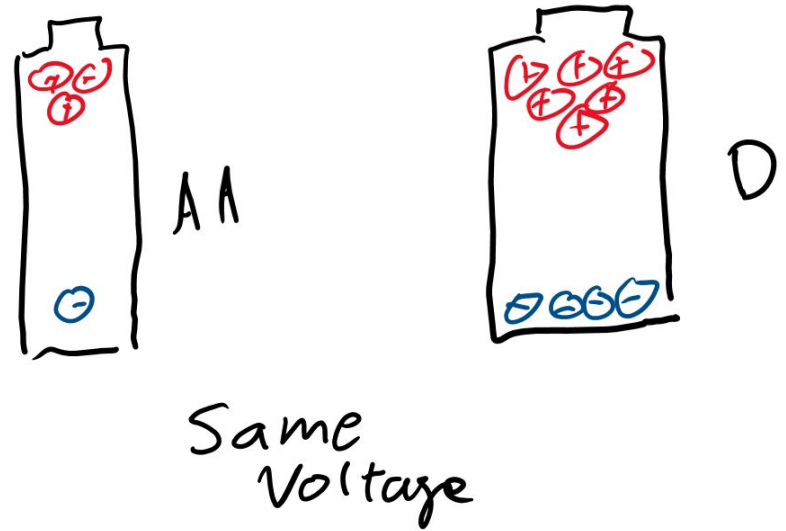
Very hard and spooky I'm sorry

Quick electricity topic

# Voltage

What was electric potential?

Voltage is the difference in electric potential.

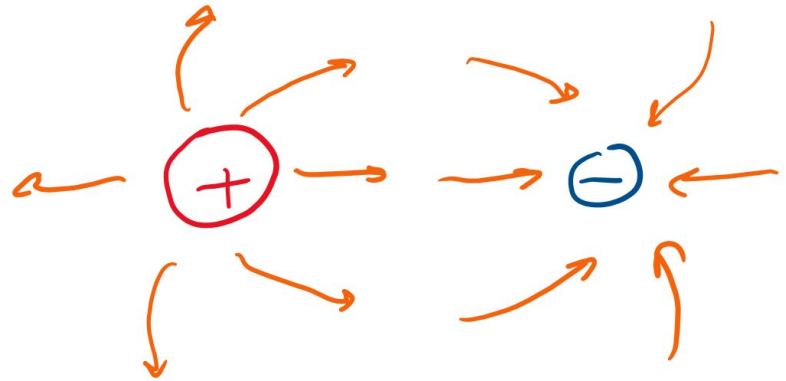


Magnetic particles?

# For electricity what particles carry charge?

What carries positive charge?

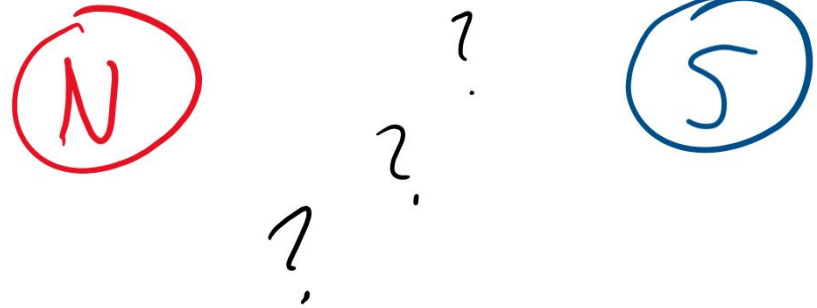
Negative charge?



# What carries it for magnets?

What is the name for “charge” but for magnets?

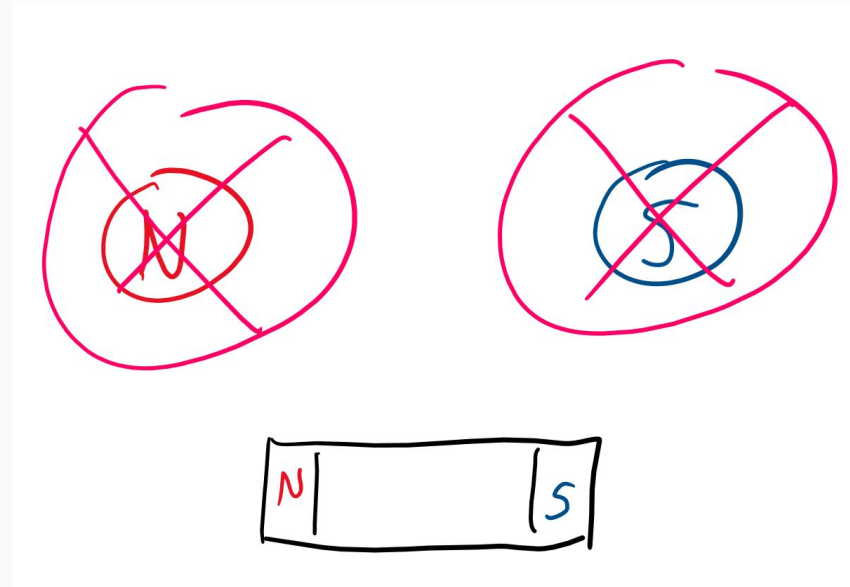
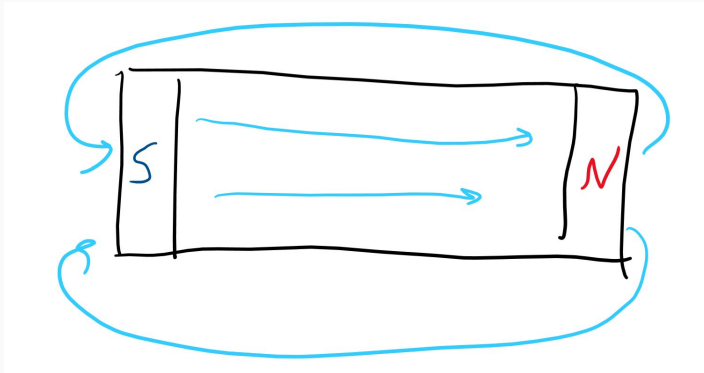
What particles would carry this “magnetic charge”?



# Magnetic particle?

Actually doesn't exist!

Magnetism is fake confirmed you can all head home now class is over.



# Induction

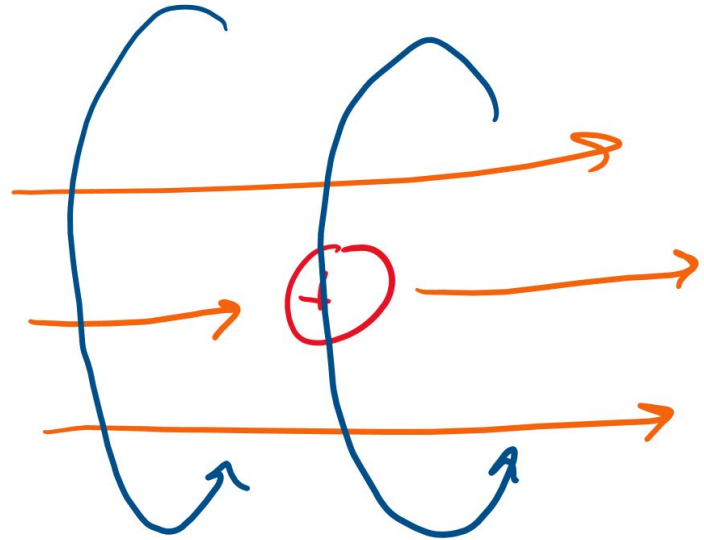


# Maxwell-Faraday

These scientists were just like okay but like magnets do exist so how do magnetic fields come about?

Moving electrical charges!

When we have a current, we also have a magnetic field.

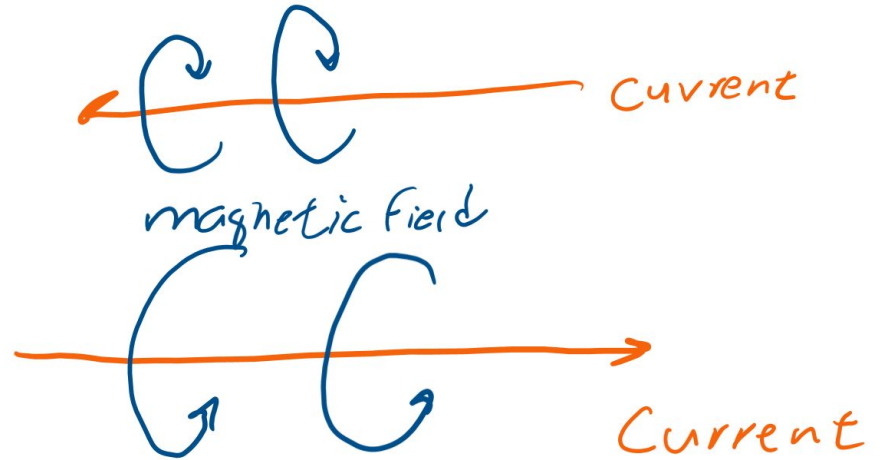


# Remember torque?

No? Well uhh. . . it's important here.

If we spin a top, we can “curl” our fingers on our right hand in the direction of motion, and our thumb will point toward the direction of torque.

If we point our thumb at current, we get magnetic field as the direction of our fingers.



Magnetic field

# Magnetic “force” is more like torque

Electric force was just  $Eq$  (electric field strength times the strength of the charge), kinda like  $F = ma$ .

Magnetic force is a bit more. . . sus.

You’d think, oh, it’s just  $F = Bq$ , but no.

Magnetic fields only act on *moving* charges, so it’s actually  $F = Bqv$  (fancy math way is  $F = qv \times B$ ).

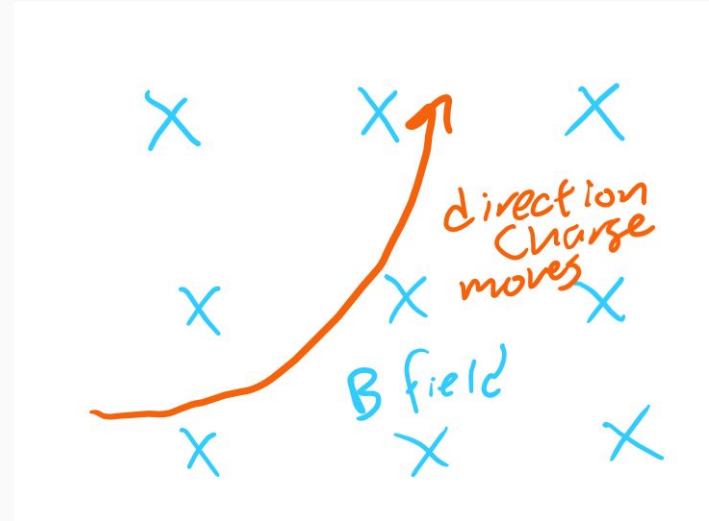
Handwritten equation:  $F = qv \times B$

Annotations:

- $F$  (pink) → force
- $q$  (purple) → charge
- $v$  (orange) → speed (charge is moving)
- $B$  (blue) → how strong the magnetic field is

# What does that do to a charge?

It makes it go in a circle, kinda like a merry go around!



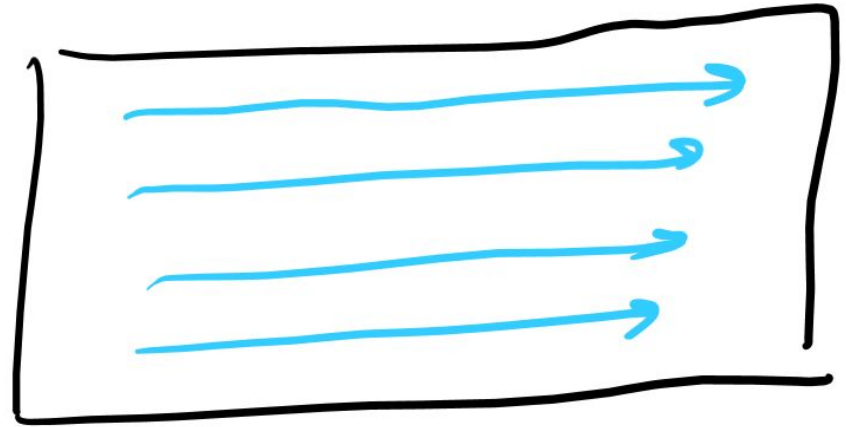
Very spooky stuff

# Field M

This is called “magnetization.”

Results from the particles themselves.

Each atom contributes to the “M” field.

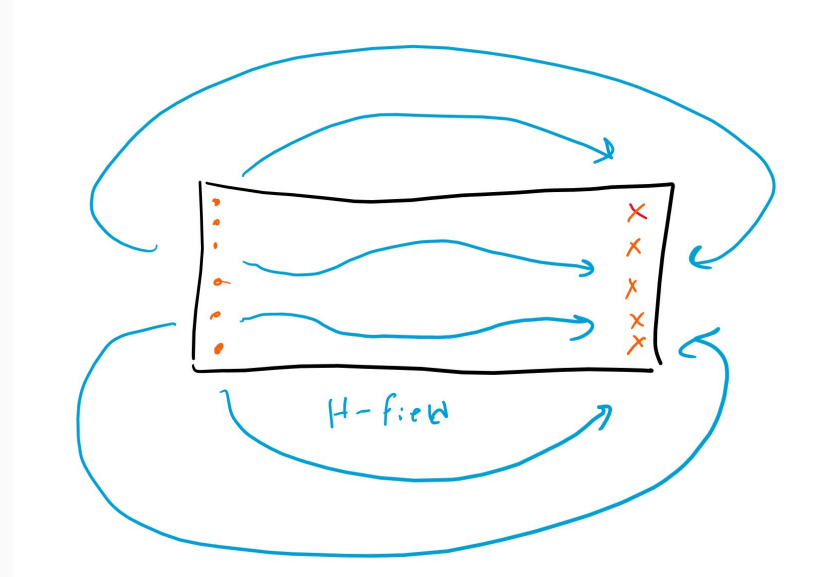


M-field

# Field H

The M field induces a current, which causes an external field, the H field.

Also called “magnetic field strength.”





# Field B

This is what people usually talk about with magnetic fields; it's the combination of both H and M field.

Also called “magnetic flux density” because they needed a sciency-sounding name.

