

#flo #inclass

# 1 | Current! and magnetism!

**flux:** analogy, total number of field lines poking out of a surface

area A and it is perpendicular to B, the flux is  

$$\phi = BA \cos(\theta)$$

if the area is tilted, we have lower flux. this makes sense, as really we are just taking the dot product from the normal to the surface.

**change in flux** is what induces current.

EMF :: electromotive force. it is the rate of change of the flux w.r.t. time

$$EMF = \frac{d\phi}{dt}$$

flux can be changed by :: - mag field strength - total area of loop - area of the loop that is crossed by the field - angle of the loop w.r.t. the field - or, ofc, combos. the pictures! they match! like this:

A-B C-D B-A D-C

## 1.1 | the experiment notes, for after break.

moving magnet across coil of wire.

figure out the induced current over time

tenth of an amp.

moving the graph gives us,

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welp, it's after 'break.' ### inductors!

- inductance :
  - backwards MEF / rate of change of current
    - \* units of volts / Amps/sec or (V \* S)/A, called a henry
- inductance can be increased with a material inside just like a capacitor

inductor {close} called an **inductor-capacitor**

- big surge of current,

**L** is used for inductance

the energy alternates between the magnetic and the capacity? called a resonant circuit fundamental way of oscillating anything LC circuit

resonant is defined as

$$\omega_0 = \frac{1}{\sqrt{LC}}$$

- magnetic field builds up in the coil as the capacitor discharges, then since the capacitor is discharged the magnetic field shrinks, which is changing flux, which charges the capacitor
  - thus, it oscillates,
    - \* but the charging is changing flux as well... with no resistance tho, this isnt lossy
- transformers use inductance to change the voltage
  - can be done by changing the number of 'wraps'
  - ration is defined by  $\frac{v_P}{v_S} = \frac{N_P}{N_S}$  where  $v_P$  vs  $v_S$  is the primary vs. secondary current, and  $N_P$  vs  $N_S$  is the primary vs. secondary turns

## 1. solids!

- diamagnetic
    - most materials
      - \* however, all materials have this characteristic
      - \* but in other materials, other props overwhelm it
    - no polarized particles, becomes aligned in the presence of magnetic field
  - paramagnetic
    - polarized particles, magnetic field aligns them
  - and ferromagnetic
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## 1.2 | the experiment.

### 1. ex1.

- took three resistors in parrelel to make it work
- taped down the magnetic field sensor right ontop of the wire
- had a large wire loop far away from the sensor, w/ battery, resistors in parrelel, current sensor.
- had a current probe and a magnetic field probe going into logger pro