Electromagnetism/ Induction

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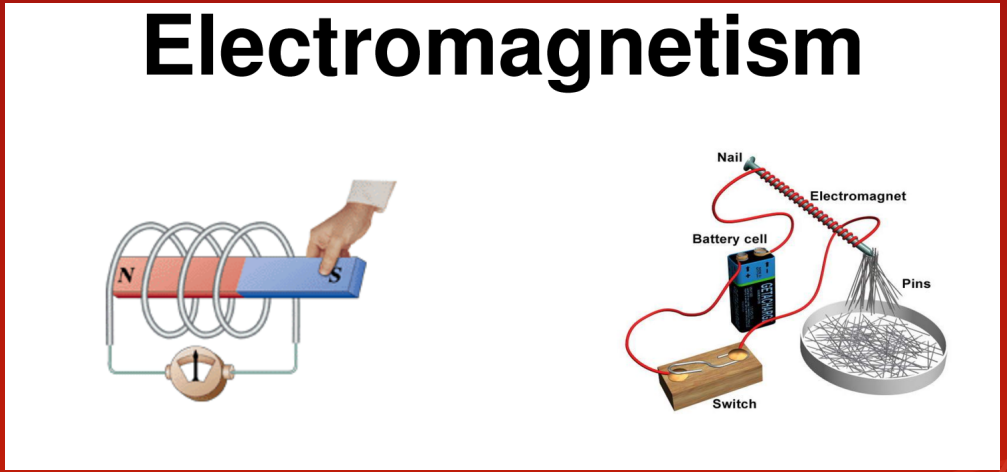
Electromagnetism

Electromagnetism is the study of electromagnetic force.

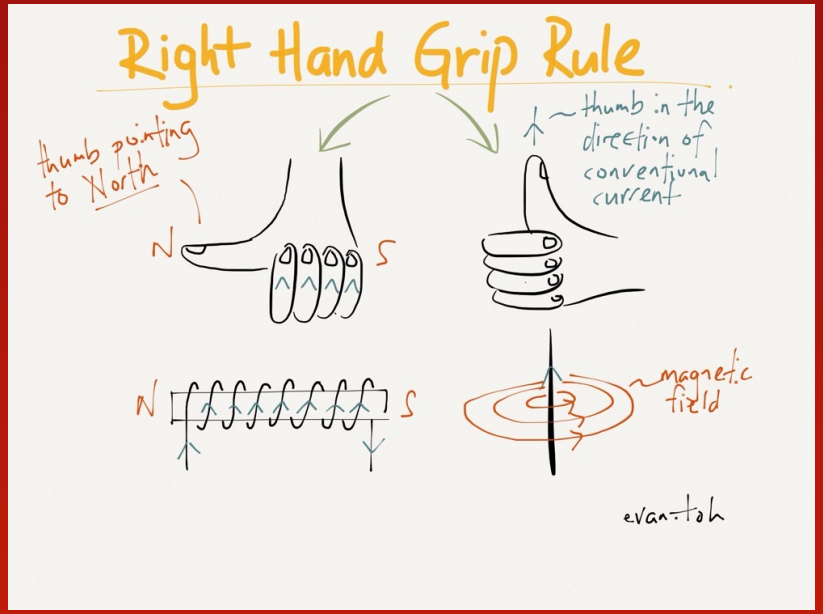


Electromagnetic Force

- the attractive or repulsive force between charged particles and magnets
  - Like gravity, electromagnetic force is one of the fundamental forces

Right- hand rule

- One is able to find the direction of the magnetic field around a current-carrying wire using this method
- Scientists use this method to explain how the directions of electric and magnetic properties relate.



Electromagnetic Induction

- Electromagnetic Induction is the process of using magnetic fields to produce voltage, and in a closed circuit, a current.
- Anytime you hear “Induction” it simply means:
  - Induction = generating electricity using magnetism
- A changing electric current can make magnetism and a changing magnetic field can make electricity

EMF Formula (Faraday's Law)

- *Emf* =-N△Φ/△t : induced voltage (emf) = change in flux per time through N coils
  - Volts= Webber/sec (units)

- *Emf* =Blv : induced voltage = length of wire (l) moving with speed (v) through magnetic field (B)
  - Volts= (Tesla)(m)(m/sec) (units)

EMF example

What is the length of a wire moving @ 7 m/s in a magnetic field of 0.25T? The included voltage is 55v.

EMF Solving

Emf = Blv

55 = .25 (l) 7

55 = 1.75 (l)

/ 1.75

31.43m = l

What is the length of a wire moving @ 7 m/s in a magnetic field of 0.25T? The included voltage is 55v.

Transformer Equation

- Transformer Equation solved for output voltage:
  - $V_2 = (N_2/N_1)V_1$

Transformer Problem

What is the output voltage of a transformer plugged into the wall with a primary 70 turn coil and a secondary 1,000 turn?

Transformer Solving

$V_2 = (N_2/N_1)V_1$

$V_2 = (1{,}000/70)\ 120$

$V_2 = (14.286)\ 120$

$V_2 = 1{,}714$ volts

What is the output voltage of a transformer plugged into the wall with a primary 70 turn coil and a secondary 1,000 turn?