Electromagnetism and max well's law

Group 5 and 6
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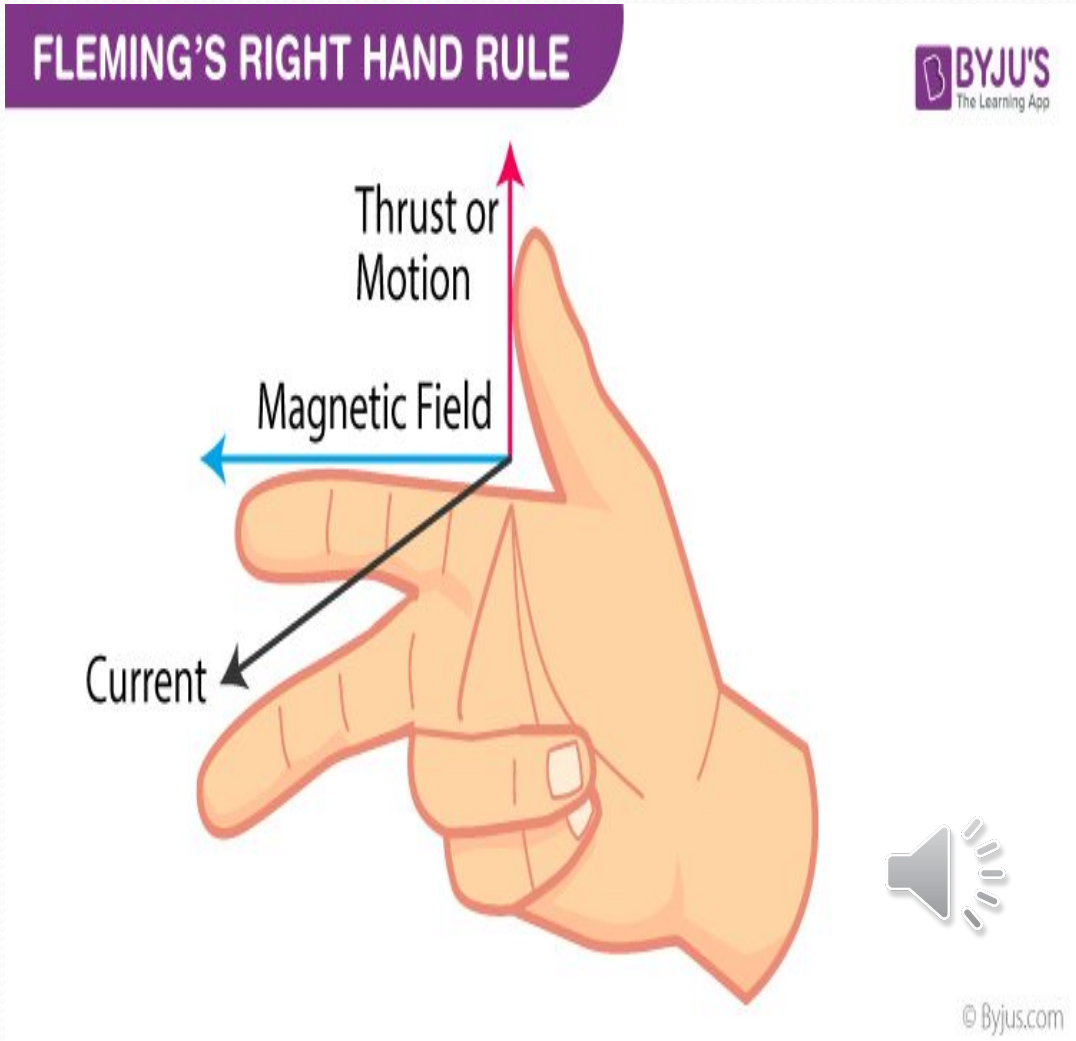
Electromagnetism

- Electromagnetism is a branch of physics which deals with study of electromagnetic force, which takes place between electrically charged particles.
- Electromagnetism is a process where a magnetic field is created by introducing the current in conductor, when a conductor is electrically charged it generates magnetic lines and
- Electromagnetism helped in establishing the relationship between electricity and magnetism.

The right hand rule

The direction of magnetic lines and force can be determined using right hand rule

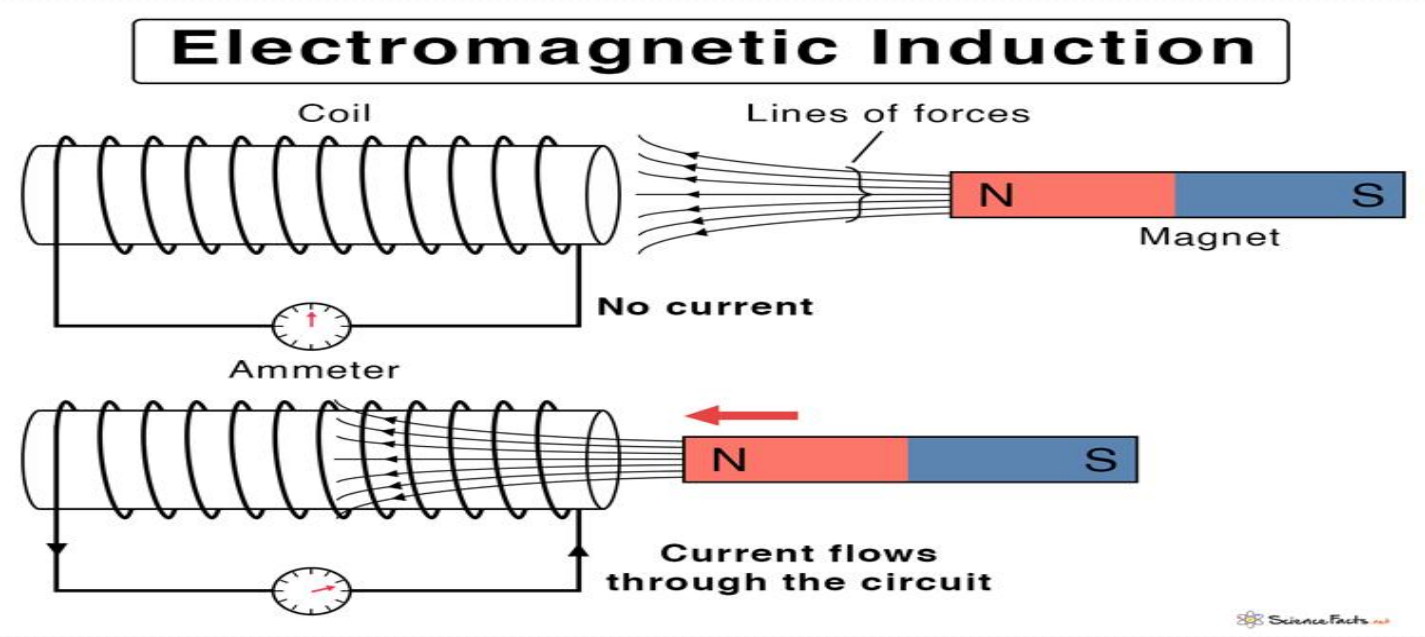


What is Electromagnetic force?

- Electromagnetic force is a type of force that occurs between electrically charged particles and is the combination of magnetic and electrical forces.
- The electromagnetic force can be attractive or repulsive.
- Electric and magnetic force regions

Electromagnetic induction

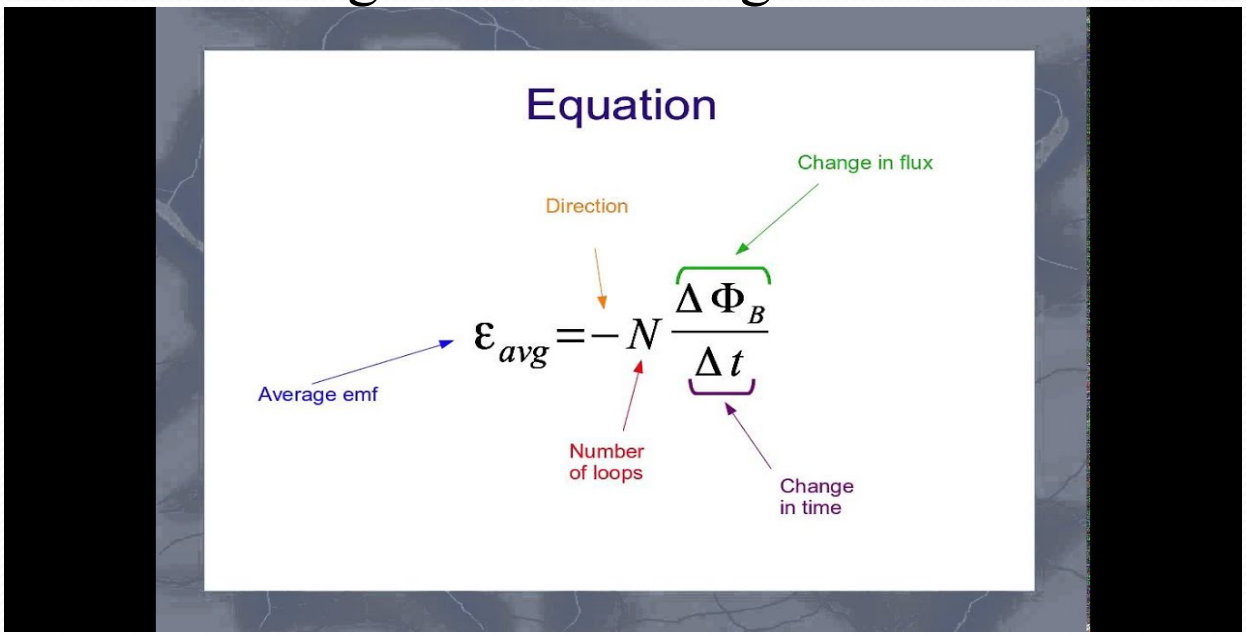
- When we put the conductor or move it through the magnetic field, it will produce electricity. we refer this electromagnetic induction.



faraday's law

I. 1st law: when a conductor is placed in a varying magnetic field an EMF is induced. if a conductor is closed, a current is induced which is called induced current.

II. 2nd law :the induced EMF in a coil is equal to the rate of change of flux linkage.



The flux linkage is the product of the number of turn in the coil.

Max well's law

- The Maxwell's equations were published by the scientist "James Clerk Maxwell" in the year 1860.
- These equations tell how charged atoms or elements provide electric force as well as a magnetic force for each unit charge.
- The equations of Maxwell explain how magnetic fields can be formed by electric currents as well as charge.
- All these equations are not invented by Maxwell; however, he combined the four equations which are made by Faraday, Gauss, and Ampere.
- The primary equation permits you to determine the electric field formed with a charge.
- The next equation permits you to determine the magnetic field, and the remaining two will explain how fields flow around their supplies.

Max Well's four equations

Max well's four equations explain the two fields occurring from the supplies of electric as well as current.

- first law: Gauss' Law for Electricity
- Second Law: Gauss' Law for Magnetism.
- Third Law: Faraday's Law of Induction.
- Fourth Law: Ampere's Law

$$\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$$

$$\nabla \cdot \mathbf{B} = 0$$

$$\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$$

$$\nabla \times \mathbf{B} = \mu_0 \mathbf{j} + \frac{1}{c^2}\frac{\partial \mathbf{E}}{\partial t}$$