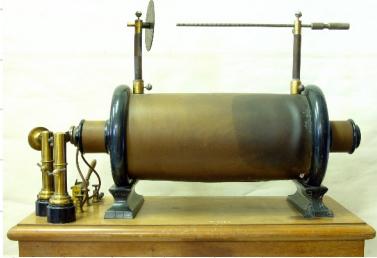
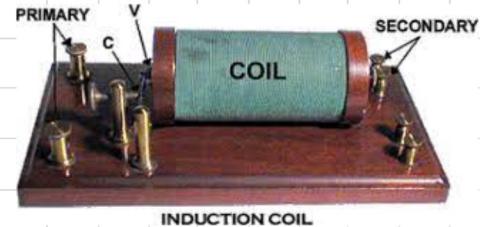


ELECTROMAGNETICS

Unit 4
Session 1

Introduction to -

- Electromagnetics
- Working Principle of Electromagnet
- Difference between Magnet and Electromagnet
- Induction Coil



Lesson Aims:



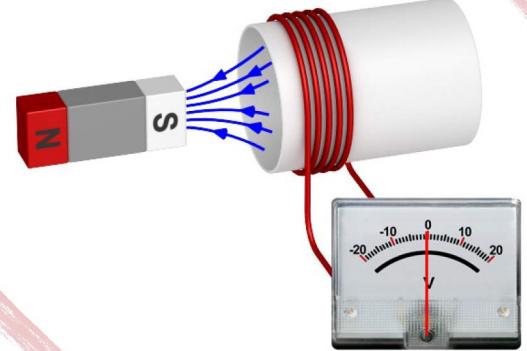
1. Summarized working principle of the electromagnet.
2. Identify different magnetic effects
3. Classify Induction Coil

- What is the working principle of an induction coil?
- What is the principle of induction heating?
- How do you use an induction heating coil?



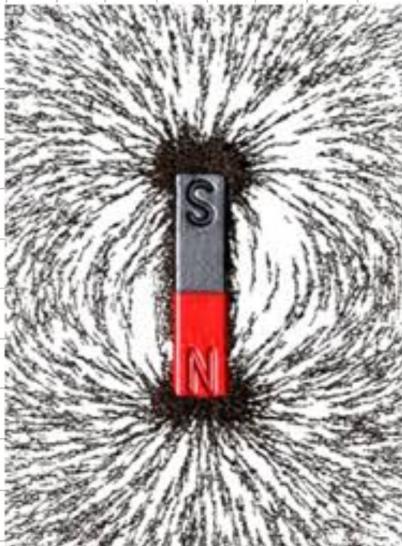
Electromagnetics

Electromagnetic induction is the creation of an electro-motive force (EMF) (Electric and magnetic fields (EMFs) are invisible areas of energy, often referred to as Radiation, that are associated with the use of electrical power and various forms of natural and man-made lighting) by way of a moving magnetic field around an electric conductor and, conversely, the creation of current by moving an electrical conductor through a static magnetic field. Electromagnetic interference (EMI) is also known as electric current and electromagnetic induction and may also be called magnetic induction, as the principle remains the same whether the process is carried out through an electromagnet or static magnet.



Magnets

A magnet is defined as an object which is capable of producing a magnetic field and attracting unlike poles and repelling like poles.



Properties of magnet:

When a magnet is dipped in iron filings, we can observe that the iron filings cling to the end of the magnet as the attraction is maximum at the ends of the magnet. These ends are known as the poles of the magnets.
Magnetic poles always exist in pairs.

Whenever a magnet is suspended freely in mid-air, it always points in a north-south direction. Pole pointing towards the geographic north is known as the North Pole and the pole pointing towards the geographic south is known as the South Pole.

Like poles repel while unlike poles attract.
The magnetic force between the two magnets is greater when the distance between these magnets is lesser.

Types of Magnet -

Permanent Magnets:

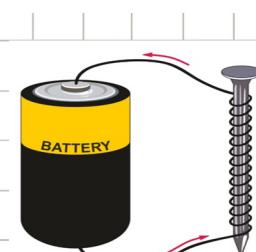
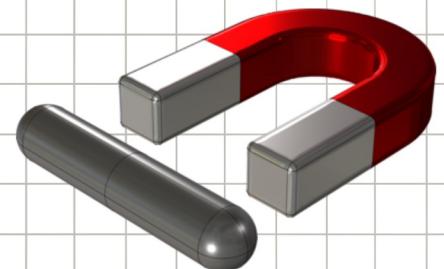
Permanent magnets are those magnets that are commonly used. They are known as permanent magnets because they do not lose their magnetic property once they are magnetized.

Temporary Magnet:

Temporary magnets can be magnetized in the presence of a magnetic field. When the magnetic field is removed, these materials lose their magnetic property. Iron nails and paper clips are examples of temporary magnets.

Electromagnet:

Electromagnets consist of a coil of wire wrapped around the metal core made from iron. When this material is exposed to an electric current, a magnetic field is generated making the material behave like a magnet. The strength of the magnetic field can be controlled by controlling the electric current.

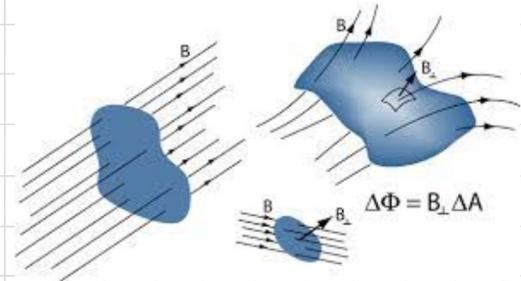


Brainstorming



Magnetic Flux: The magnetic flux linked with any surface is equal to the total number of magnetic lines of force passing normally through it. It is a scalar quantity.

The phenomenon of generation of current or emf by changing the magnetic flux is known as Electromagnetic Induction (EMI)

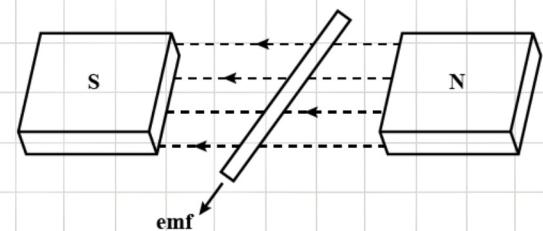


Faraday's Law of Electromagnetic Induction

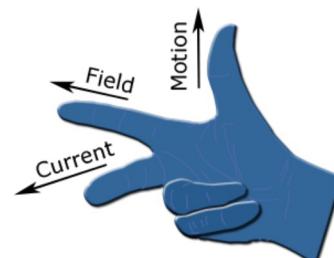
Induction First Law: Whenever magnetic flux linked with the closed loop or circuit changes, an emf induces in the loop or circuit which lasts so long as the change in flux is continuous.

Second Law: The induced emf in a closed loop or circuit is directly proportional to the rate of change of magnetic flux linked with the closed loop or circuit

Lenz's Law: The direction of induced emf or induced current is such that it always opposes the cause that produces it.



Fleming's Right Hand Rule If the thumb, forefinger, and middle finger of the right hand are stretched mutually perpendicular to each other such that the forefinger points in the direction of magnetite field, the thumb point standards the direction of magnetic force, then the middle finger points towards the direction of induced current in the conductor.



Activity

Making Induction Coil:

- 1) Demonstration through video and hands-on practice on the different magnets.
- 2) Divide the class into pairs.
- 3) Each pair gives a different magnet.
- 4) Rotate each pair for every assignment



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Reflection

- 1) What are the magnetic Properties of a bar magnet?
- 2) What are the uses of magnets?
- 3) What are electromagnets?
- 4) What are magnets made of? Write down the types of magnets.
- 5) Write any two properties of a magnet.
- 6) What is the meaning of induction coil

See

For more information -

