Magnetism

ELEC 105
ELEC 106

Magnetic Materials

Magnetite consists of an iron oxide.
A natural magnet attracts certain materials:

- cobalt
- nickel
- iron
- steel
- alloys of any of the above

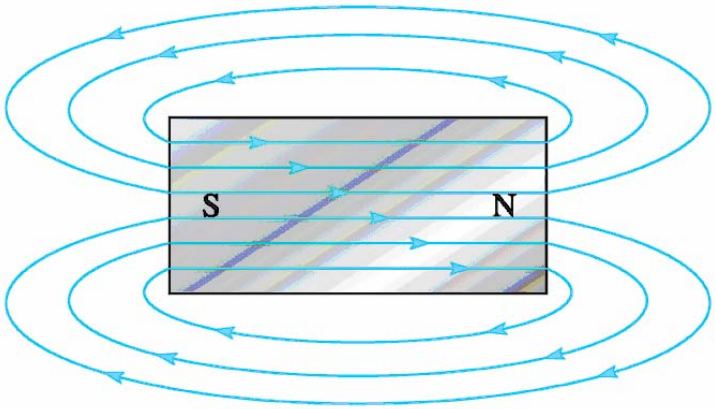
These materials are called **Magnetic** materials.

Properties of Magnets

Magnets exhibit the following properties:

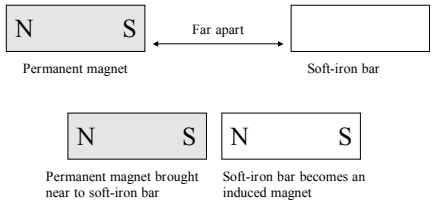
1. They attract magnetic materials
2. They have **2 magnetic poles**;
   a. the North and South seeking poles
   b. These are the strongest parts of the magnets
   c. The poles are found very near (but not at) the ends of the magnet
3. If allowed to swing freely a magnet will come to **rest** with one end pointing towards the Earth's **North** pole, the other end pointing towards the Earth's **South** pole
4. **Like poles repel, Unlike poles attract**

Magnetic Lines of Flux



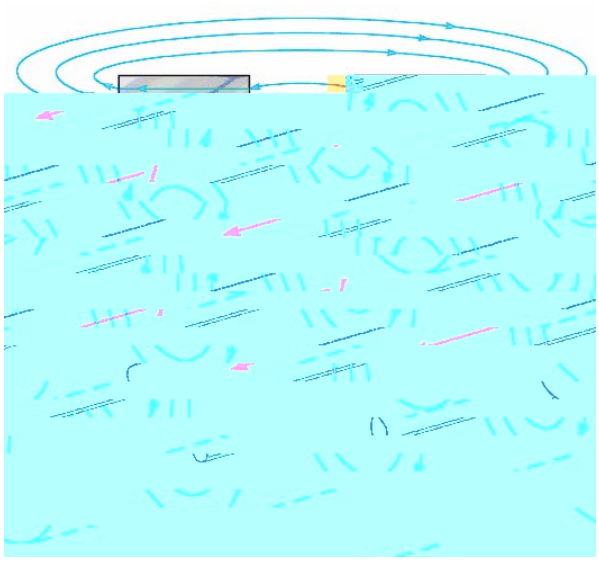
Blue lines represent only a few of the many magnetic lines of force in the magnetic field.

Induced Magnetism



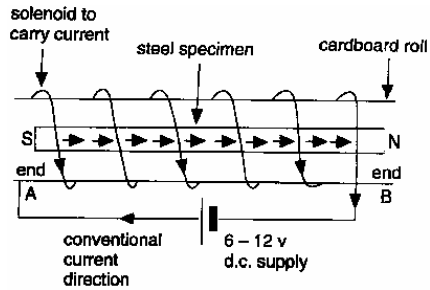
- When a non-magnetized magnetic material is brought near to (or touches) a magnet, the material itself will become a weak magnet
- This is called induced magnetism
  - this means the material has magnetism induced in it
- Induced magnetism in magnetic materials is the reason that these non-magnetized objects are able to be attracted to magnets
- Notice that magnetic induction, an opposite pole is always induced
  - 2 unlike poles facing each other is observed during magnetic induction
- If placed sufficiently near to each other, attraction occurs between the permanent & induced magnets

Laws of Magnetism



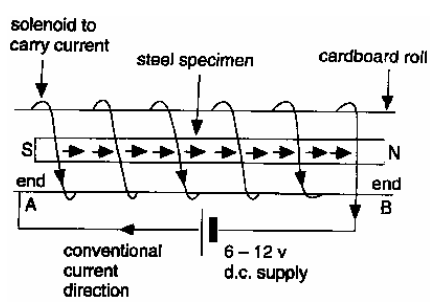
Electromagnetism

- Place the steel object inside a coil of wire (a **solenoid**).
- Pass a **direct current through the solenoid**
- A magnetic field is produced on the solenoid.
- As such, the steel rod is now placed inside a magnetic field.
- When the current is turned off the steel rod is found to be magnetized

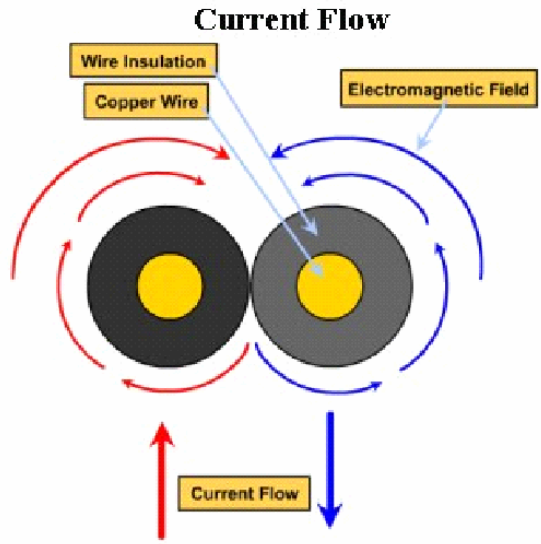


Electromagnetism

- Magnetization by the use of an electrically-generated magnetic field in a Solenoid
- The polarity of the newly-formed magnet for conventional current flow can be determined using the **Right-hand Rule**.
  - Wrap the fingers around the coil form in the direction of the current flow in the solenoid
  - the thumb will point in a direction indicating the end which becomes the N-pole



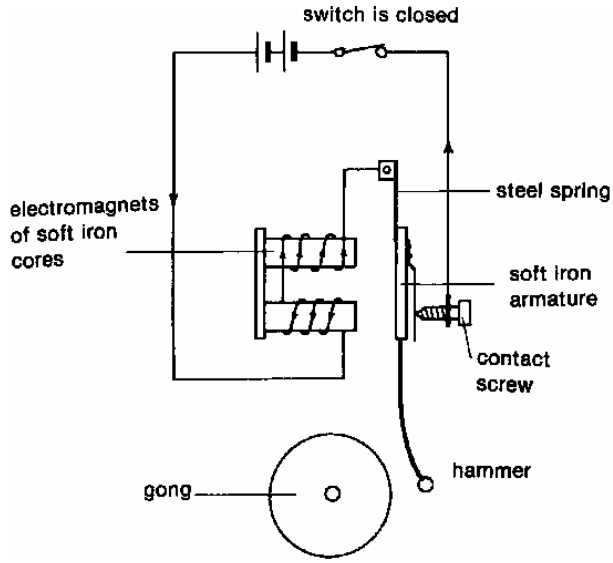
Current Flow in Twisted Pair



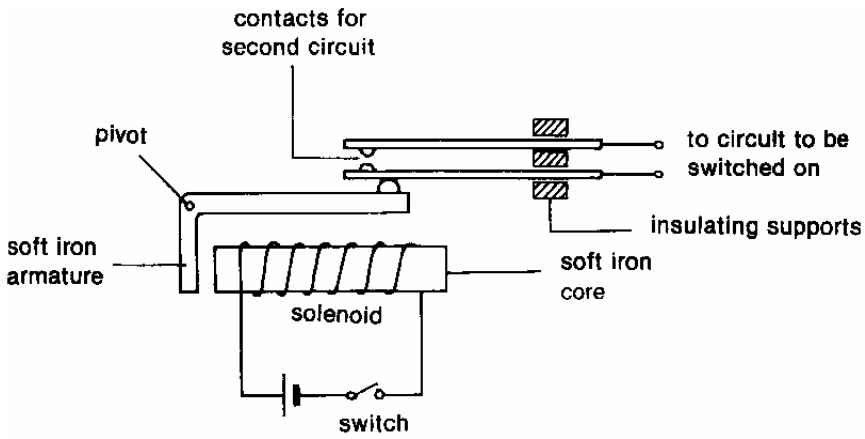
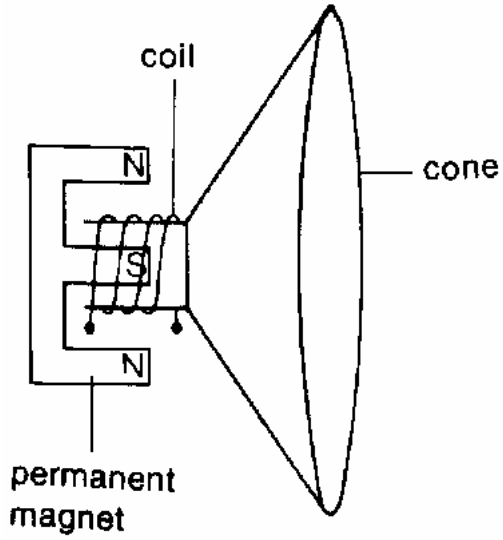
DeMagnetization by Heating & Hammering

Heat a magnet
Then hammer it as it is allowed to cool in the absence of a magnetic field i.e. facing East-West

Example of Electromagnetism – Door Bell



Example of Electromagnetism – Relay



Example of Electromagnetism – Speaker