



## What is Magnetism?

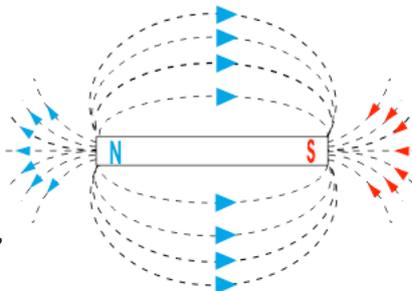
To understand electricity, we need to first understand the meaning of magnetism.

Magnetism is the force that causes a nail or paper clip to be pulled towards a magnet – to see magnetism in action, have a play around with a magnet and see what types of objects you can attract to it.

Some metals, like lodestone, are magnets in their natural state, while other metals like iron, nickel and cobalt can be made into magnets (or 'magnetised') by placing them in a strong magnetic field.

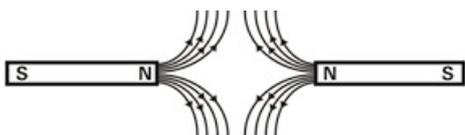
Everything around us is made up of tiny particles called atoms.

These particles can be positively charged (protons), negatively charged (electrons) or neutral (neutrons).



The electrons spin around the nucleus of an atom, creating a tiny magnetic field. Most objects are not magnetic because the atoms are arranged so that the electrons spin in different, random directions, and cancel each other out.

But in magnets, the molecules are arranged so that the electrons spin in the same direction. This arrangement of atoms creates two poles in a magnet, a North-seeking pole and a South-seeking pole.

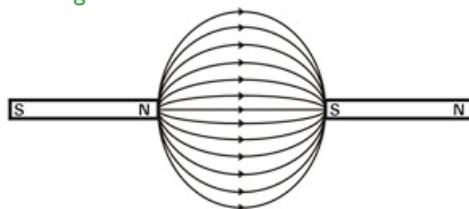


Like poles of magnets (N-N or S-S) repel each other.

With magnets, opposites attract. If you try to push the South or the North poles of two magnets together, they will repel each other. If you hold the North (N) and the South (S) poles of two magnets together, they attract each other with a strong force. Just like protons and electrons, opposites attract.

## Bar Magnet

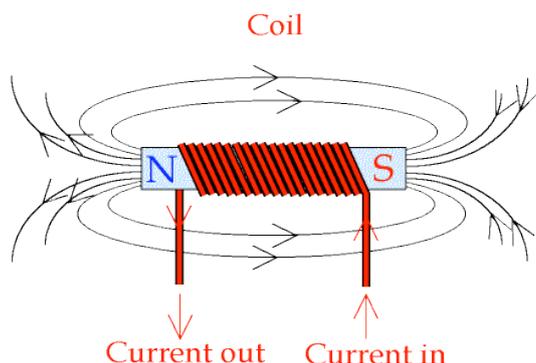
The magnetic force in a magnet flows from the North pole to the South pole. This creates a magnetic field around a magnet.



Opposite poles of magnets (N-S) attract each other.

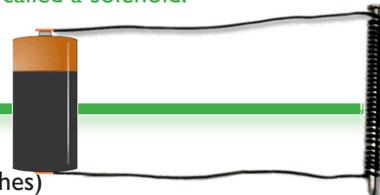
It is by using these special properties of magnets that we are able to make electricity.

Because the field near a straight wire is too weak for most purposes, scientists have found that wire wound into a coil will produce a much stronger field (imagine the coil being a lot of straight wires joined together). Such a coil is called a solenoid.



By placing a soft iron rod inside a solenoid through which current is flowing, it becomes magnetic. Called an electro-magnet, this phenomenon forms the basis of generators, television and most modern electronics.

## Make Your Own Magnet



### You will need:

- A large iron nail (about 7.5 cm or 3 inches)
- About 90cm (3 feet) of THIN COATED copper wire
- A fresh D size battery
- Some paper clips or other small magnetic objects

### What to do:

1. Leave about 20cm of wire loose at one end and wrap most of the rest of the wire around the nail. Try not to overlap the wires. Cut the wire (if needed) so that there is about another 20cm loose at the other end too.
2. Now remove about an inch of the plastic coating from both ends of the wire and attach the one wire to one end of a battery and the other wire to the other end of the battery. See picture below. (It is best to tape the wires to the battery - be careful though, the wire could get very hot!)
3. Now you have an ELECTROMAGNET! Put the point of the nail near a few paper clips and it should pick them up!

NOTE: Making an electromagnet uses up the battery power quickly which is why the battery may get warm, so disconnect the wires when you are done experimenting.