Electromagnets

4. Magnets

CONCEPT 1

LESSON GUIDE

MAGNETIC FORCE AND MAGNETIC FIELDS

PRECISE LEARNING POINTS

KNOW

I know what a permanent magnet and how it interacts with other objects.

APPLY

I can apply my knowledge to describe the magnetic field around a permanent magnet.

EXTEND

I can extend my knowledge to explain how the magnetic force changes in a magnetic field.

NOTES

There are 4 materials that are naturally magnetic; nickel, cobalt, iron and steel. These materials can be made into permanent magnets. A permanent magnet can make other magnetic materials move without touching them. This was discovered by an Ancient Greek shepherd called Magnes who found that the iron nails in his shoes moved and he felt a pull when he walked over a certain type of stone on the ground!

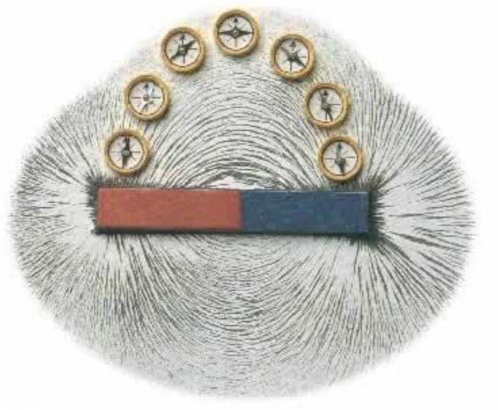
Permanent magnets have what we call poles; a north pole and a south pole.

In Ancient Greece when Magnes stumbled upon his magnetic stones he had no idea how they worked. Indeed it took another 2000 years before scientists started to understand more about them.

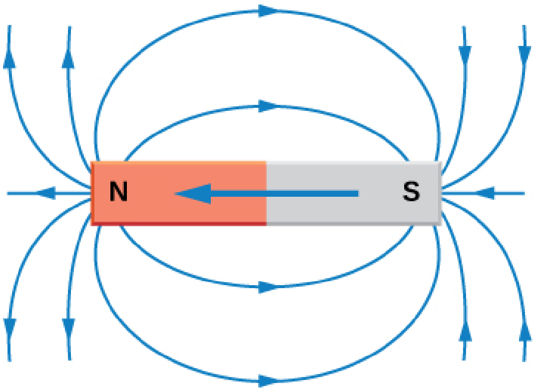
We now know that every permanent magnet has an area round about it called a magnetic field. We can't see magnetic fields but we can feel their effects, like Magnes felt the pull on his shoes. A magnetic field is the area around a permanent magnet in which another magnetic material or a permanent magnet will feel a force acting on it.

Although we can't sense a magnetic field directly (did you know that some animals can?) we can find out the shape of a magnetic field in two ways: by plotting it using a compass or by using iron filings (very small grains of iron).

The lines that we observe using these two techniques are called magnetic field lines. Both the dial on a compass and iron filings are made from a magnetic material so they will experience a force in the magnetic field and line up along a field line. We represent field lines on diagrams as follows:



Notice how the field lines are smooth, that they never cross and they have arrows to show the direction of the field. Field line arrows always point from North to South. A good way of remembering this is to think that you once went from Nursery to School!



Magnetic field lines of a bar magnet

Field lines are a bit like contour lines on a map. The closer they are together the stronger the magnetic field (like on a map where close contour lines mean a steeper hill) and the further away the field lines are the weaker the magnetic field. The magnetic field is always strongest at the poles where the field lines are closest together.

The stronger the magnetic field the stronger a magnetic force is felt by another magnet or magnetic material placed in the field and vice versa.