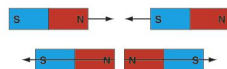


1.6 Magnets and magnetic fields

Learning objectives

After this topic you will be able to:

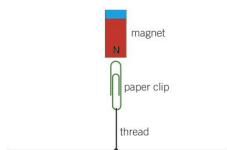
- describe how magnets interact
- describe how to represent magnetic fields
- describe the Earth's magnetic field.



▲ Magnets can attract or repel other magnets.

Memory jogger

Remember it like this: 'Like poles repel, unlike poles attract.'



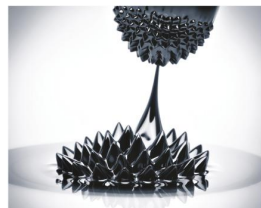
▲ There is a force on a steel paper clip in a magnetic field.

Fantastic Fact

The Earth's magnetic field keeps flipping. About 500 000 years ago the magnetic north pole was actually the south pole.

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With a magnet you can make something move without even touching it.



◀ Ferrofluid is a special liquid that is magnetic.

Attracting and repelling

A **magnet** has a **north pole** and a **south pole**.

- **North poles repel north poles.**
- **South poles repel south poles.**
- **North poles attract south poles.**

A Name the two poles of a magnet.

Only certain materials are attracted to a magnet. They are called **magnetic materials**. Iron is a magnetic material, and so is steel because steel contains iron. Cobalt and nickel are also magnetic.



◀ Information on a credit card is stored in a magnetic strip.

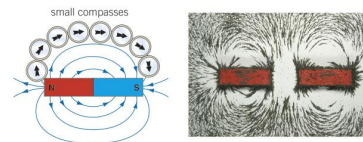
What is a magnetic field?

In an electric field there is a force on a charge. In a **magnetic field** there is a force on a magnet or a magnetic material.

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You can find out the shape of a magnetic field in two ways:

- using plotting compasses
- using iron filings



The needle of a compass lines up with the magnetic field. So do the iron filings. You can draw lines called **magnetic field lines** to represent the field. The lines go from the north pole to the south pole of the magnet, with arrows pointing from the north to the south pole.

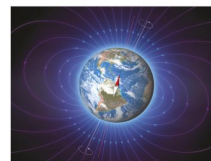
- If the magnetic field lines are closer together this shows that the magnetic field is stronger.
- A permanent magnet is a magnet that has its own magnetic field.

B State two ways that you can find out the shape of a magnetic field.

The Earth's magnetic field

If you hang a magnet up it will line up in a direction pointing north to south. This is because it is in the magnetic field of the Earth.

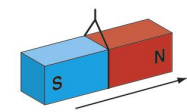
The Earth behaves as if there is a huge bar magnet inside it. There is not really a bar magnet, and physicists are not sure what produces the Earth's magnetic field.



◀ The Earth's magnetic field is the same as that of a big bar magnet with the south pole at the top of the planet.

Key Words

magnet, north pole, south pole, magnetic material, magnetic field, magnetic field line



▲ A magnet lines up with the Earth's magnetic field.

How strong?

A student wants to measure the strength of different types of magnet by holding up a paperclip as shown in the diagram on the opposite page. Draw a table for their results.

Summary Questions

- 1 Copy and complete the sentences below.
Magnets have a _____ pole and a _____ pole. Two poles that are the same will _____ and two poles that are different will _____. The needle of a _____ lines up in the _____ of a magnet. (6 marks)
- 2 Explain why the needle of a compass always points in the same direction wherever you point it in a room. (2 marks)
- 3 Design a game of skill that uses magnets. Write a list of instructions for how to play the game using the key words on this page, and describe the scoring system. (6 marks)

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