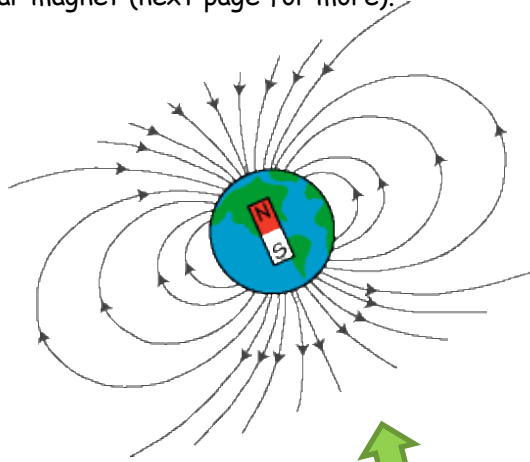


Magnetism & Electromagnetism

Page 1 (Higher)

Compass

A compass is a tiny magnetic needle which always points North. This uses the Earth's magnetic field, which is a similar field to that of a bar magnet (next page for more).



Start

Turn Over

Key Words:

- Poles** The 2 end of a magnet, either the north pole or south pole.
- Magnetise** Turn something into a magnet.
- Demagnetise** Make a magnet non-magnetic.
- Induced** Produced/created.
- Magnetic Field** The area around a magnet where a magnetic object feels a force.
- Electromagnet** An insulated wire wrapped around an iron bar.
- Coil** Wire wrapped around.
- Iron Core** The iron part inside of the electromagnet, it could be an iron nail.



Magnetic Materials

Any iron or steel object can be magnetised (or demagnetised). Only a few other materials (such as cobalt or nickel) can do this.

Permanent magnets are usually made of steel because this doesn't lose its magnetism easily.

North and South

Attract means to pull together.
Repel means to push apart.

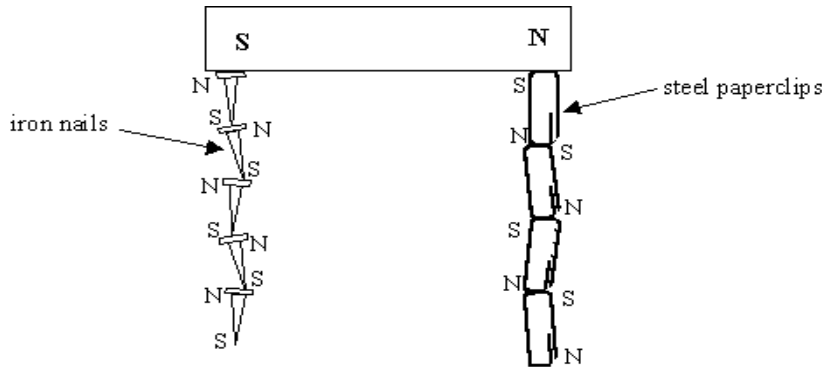
North and south poles attract each other.

North and North poles repel each other.

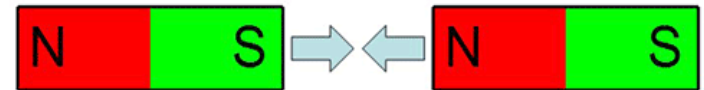
South and South poles repel each other.

Induced Magnetism

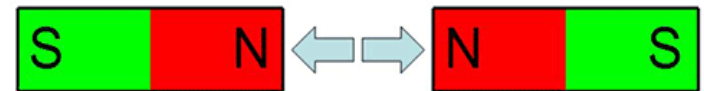
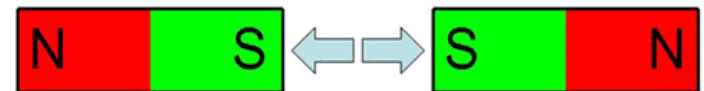
When some non-magnetic materials come close to, or touch, a magnet they become magnetic. This happens here with the iron nails and steel paper clips.



Opposite poles **attract**

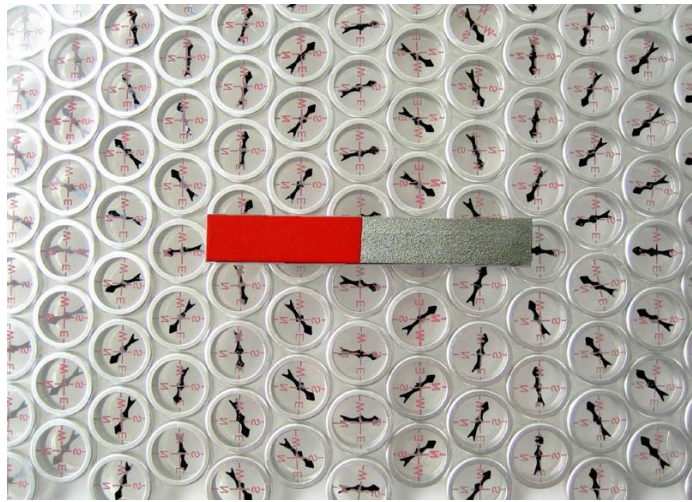


Similar poles **repel**



Magnetism & Electromagnetism

Page 2 (Higher)



You can use compasses to investigate magnetic fields.

Compare the photo above to the magnetic field of the bar magnet on the right. The compasses show you the magnetic field lines.

Electric Bell

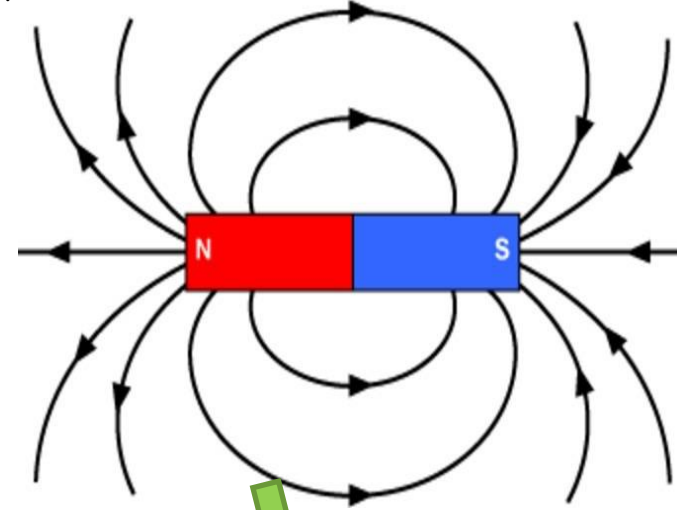
When an electric bell is connected to a battery, the iron gong is pulled onto the bell which makes it ring. At the same time, this breaks the circuit which causes it to go back to the starting position. This cycle happens quickly which is why an electric bell sounds like lots of quick rings after each other.

Magnetic Fields

A magnetic field is the area around a magnet where a magnetic object will feel a force. This is the field around a bar magnet.

There are some rules when drawing magnetic fields:

- 1) Lines come out of the North pole and into the South pole.
- 2) Lines don't cross.
- 3) The magnetic field is strongest where the lines are closer together.



Adjusting Electromagnets

We can make an electromagnet stronger by doing 3 things:

- 1) Increase the current through the wire.
- 2) Increasing the number of coils (the number of times the wire has been wrapped around the metal core).
- 3) Changing the core material.

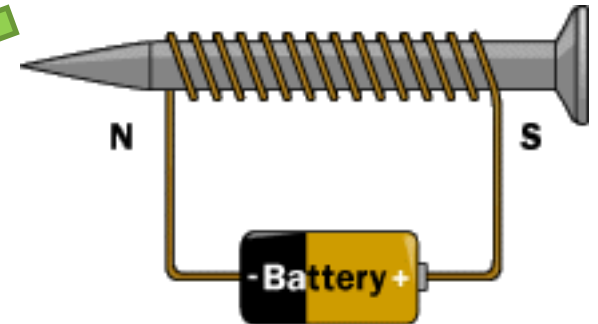


A circuit breaker has an electromagnet. If the current gets too big the electromagnet becomes strong enough to pull open a switch, breaking the circuit.

Electromagnets

An electromagnet is an insulated wire wrapped around an iron core (like an iron nail). When current is put through the wire the nail becomes magnetic.

You can make a simple one like the one below.



Electromagnets can be turned on or off so they're used in speakers, scrapyards and microphones.

Magnetism & Electromagnetism Questions (Higher)

- 1) Will each of the following pairs of magnets attract or repel?



- 2) Name 3 magnetic materials.
- 3) What are most permanent magnets made of?
- 4) Explain what an induced magnet is.
- 5) How could you make a paper clip behave like a magnet?
- 6) Sketch the magnetic field around a bar magnet.

- 7) How could you use compasses to investigate the magnetic field of an object?
- 8) What is an electromagnet?
- 9) Write a method to help a primary school student to make a simple electromagnet.
- 10) What 3 things could you do to adjust the strength of an electromagnet?
- 11) Give 3 examples of uses for electromagnets and explain why they're used here.
- 12) When would a simple magnet be more suitable than an electromagnet? Justify your answer.
- 13) When would an electromagnet be more suitable than a normal magnet? Justify your answer.
- 14) How would you prove that one electromagnet is stronger than another?